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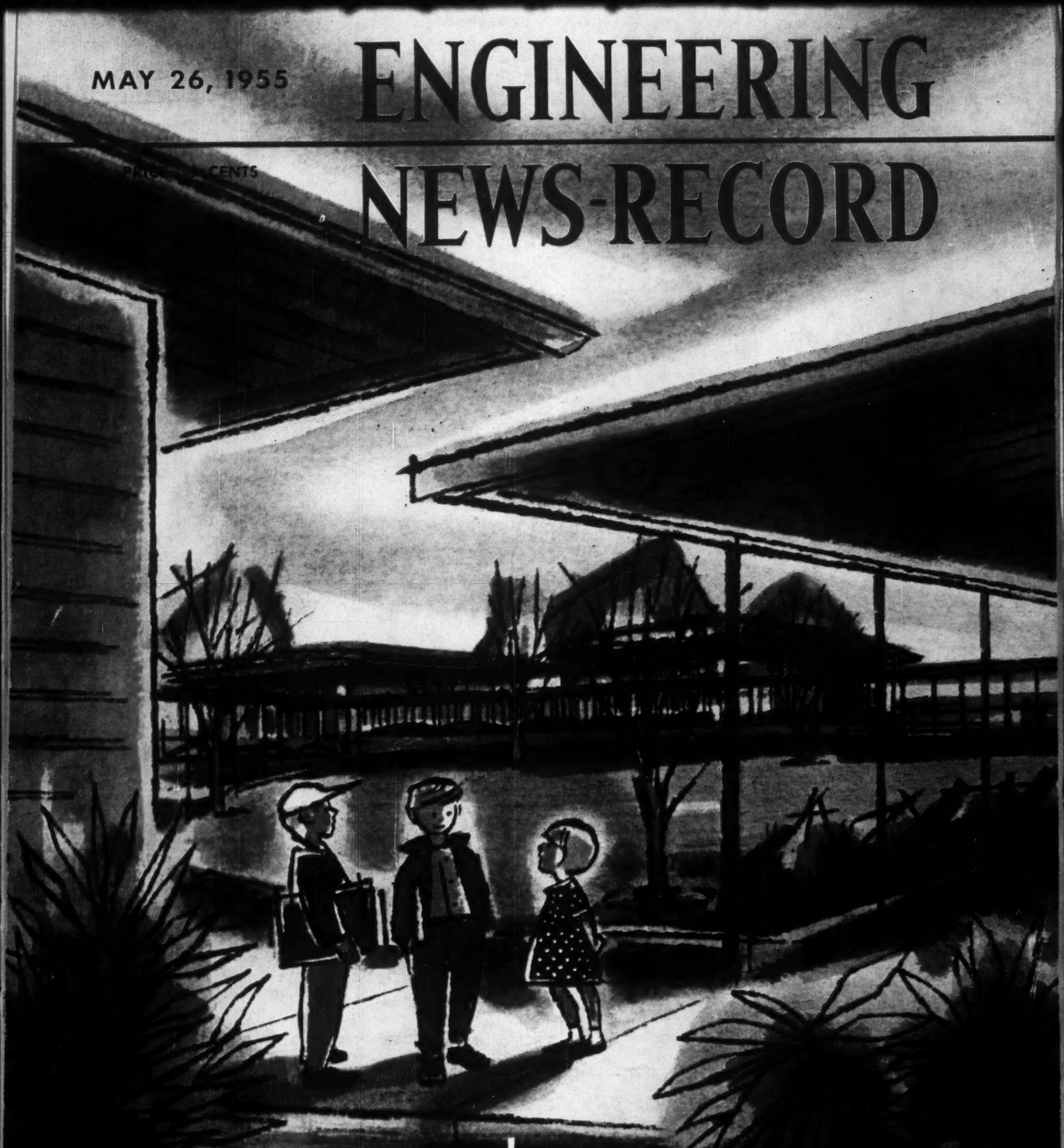

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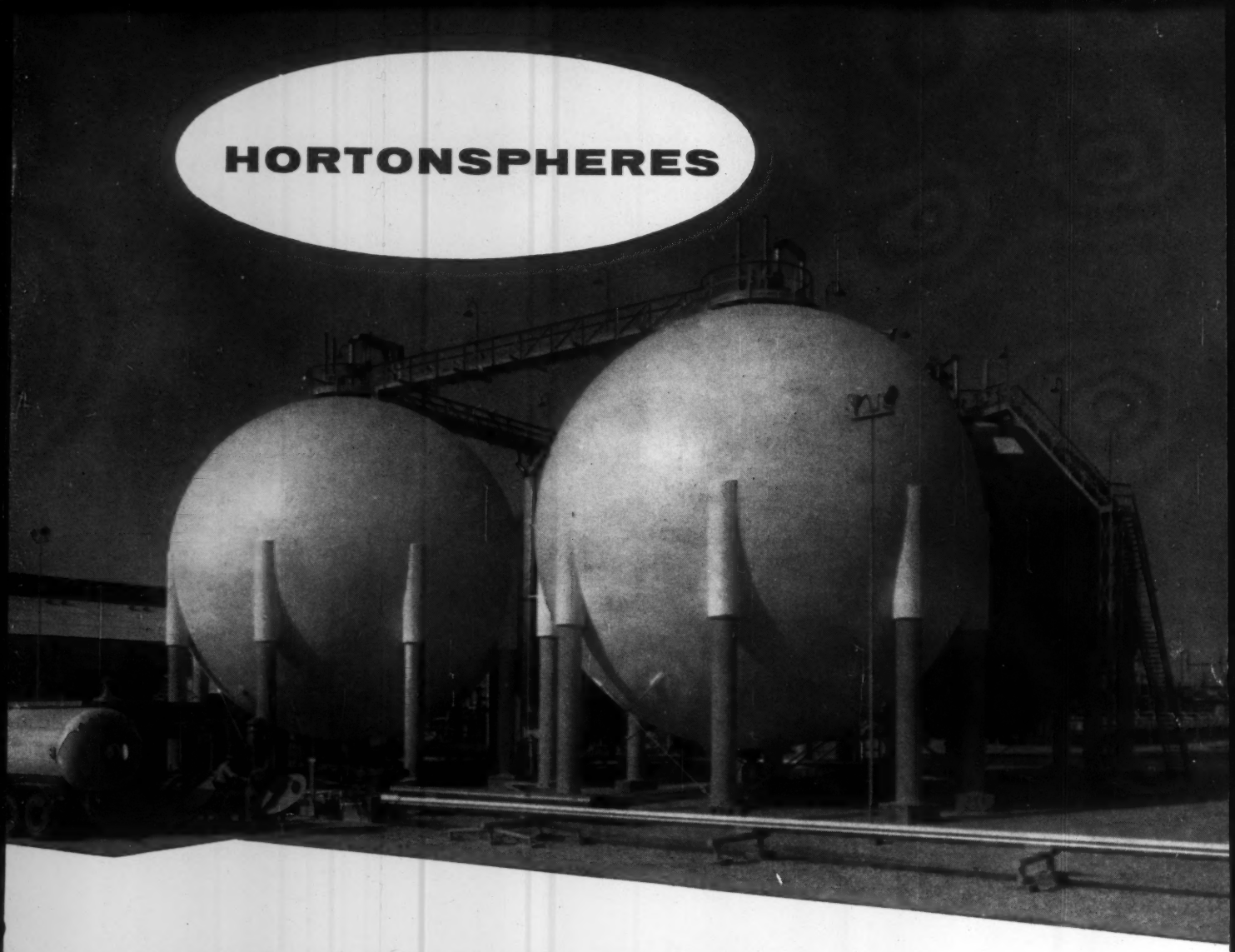

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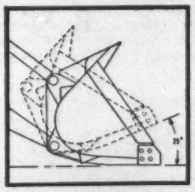
POPULAR 2-YD HD-9G TRACTOR SHOVEL NOW OFFERS

Higher Work Capacity

Design refinements in the Allis-Chalmers HD-9G now make it even more productive than ever. First, the net engine output has been increased to 100 hp, with 23,000 lb of push for extra crowding and digging ability, fast work cycles.

Streamlined bucket design now helps roll in large loads with less tractor effort. The back of the bucket has been brought forward and the sides extended to cut spillage, put more pay load where it's wanted. Cleaner dumping with the new bucket saves the operator time and effort shaking out loads.



A new addition to the wide variety of attachments available for the HD-9G Tractor Shovel is the Tip-Back bucket which allows the operator to roll the bucket back approximately 25° at ground level. Ideal for handling greater capacities of loose stockpiled materials, the Tip-Back bucket can be carried lower to the ground for greater stability . . . can load bulky objects easier.

New-type ceramic master clutch lining reduces lever pull, makes it easier for the operator to do more. The new HD-9G helps the operator do more in other ways, too — giving him full vision, fast and easy control, cleaner platform and more comfortable seat from which to work, and more working time with truck wheels, support rollers and idlers that need greasing only once every 1,000 hours.

Lower Operating Cost

Design improvements also add longer life to the HD-9G under all work conditions. Heavy box-section booms are 50 percent stronger, assuring proper alignment even working in the toughest materials. The low design of the new HD-9G combination stabilizer and cowl not only offers easy accessibility for maintenance and service, but contributes to maximum operator vision. New ceramic master clutch lining operates longer between adjustments, increases clutch life.

Hydraulic system provides new maintenance simplicity, safety of operation, as well as improved visibility. With new-style tank, there are few external fittings, greatly reducing possibility of outside leaks. Magnetic filters and suction-line screens protect the entire system from damaging grit. New, improved hydraulic pump is designed for long life as well as fast and accurate bucket action.

Heavy-duty truck wheels and idlers are available for particularly tough working conditions. One-piece, full-length main frame permits unit construction so that major assemblies can be removed without disturbing adjacent units, putting tractor back on the job in hours rather than days.

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Publisher

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For sustained high output in heavy-duty service, here's an excavator that will meet your demands fully — the Bucyrus-Erie 4-cu. yd. 88-B. Three important advantages contribute to the 88-B's high production performance: superior quality construction that stands up under digging stresses; front-end design that applies power efficiently; and overall machine balance that means smooth operating control. Illustrated here are some of the benefits you get; for the *full* story see your nearest Bucyrus-Erie distributor.

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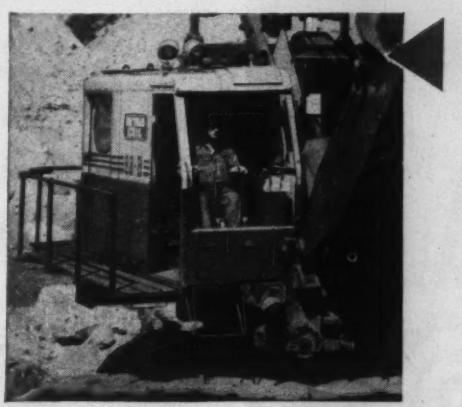

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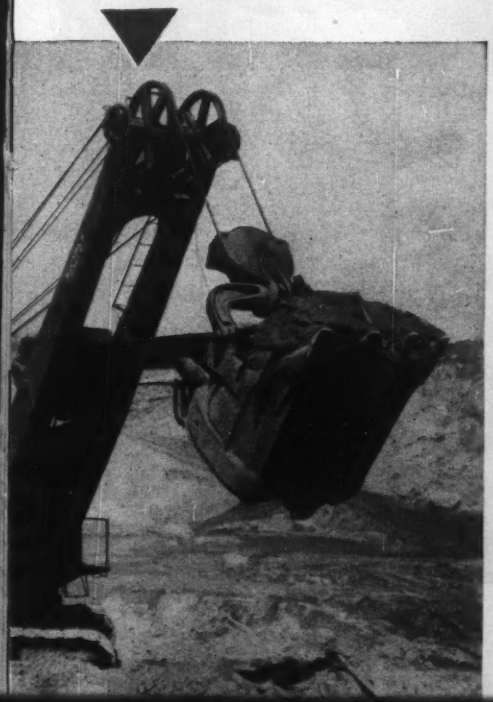

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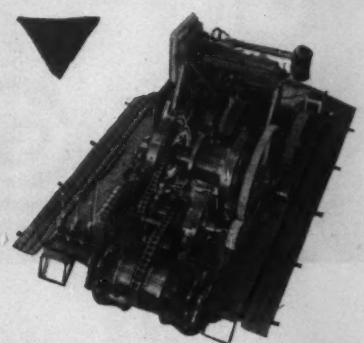
Neat, compactly arranged deck machinery is real evidence of outstanding engineering. Parts are simple yet strongly built, and are easy to get at for routine maintenance. Power is smoothly, quietly transmitted by the most direct route through anti-friction bearings.



To meet *your* job conditions, you can take your choice of three crawler mountings — standard with flat ends, long with tapered ends, or long with flat ends. Four A-frames are offered: standard high and low frames, and power-controlled high and low frames. Front-end equipment for crane, clamshell, dragline and stripping shovel operations is available. Power boom hoist is standard equipment; an independent friction-type boom hoist is also available at extra cost. 138E55C

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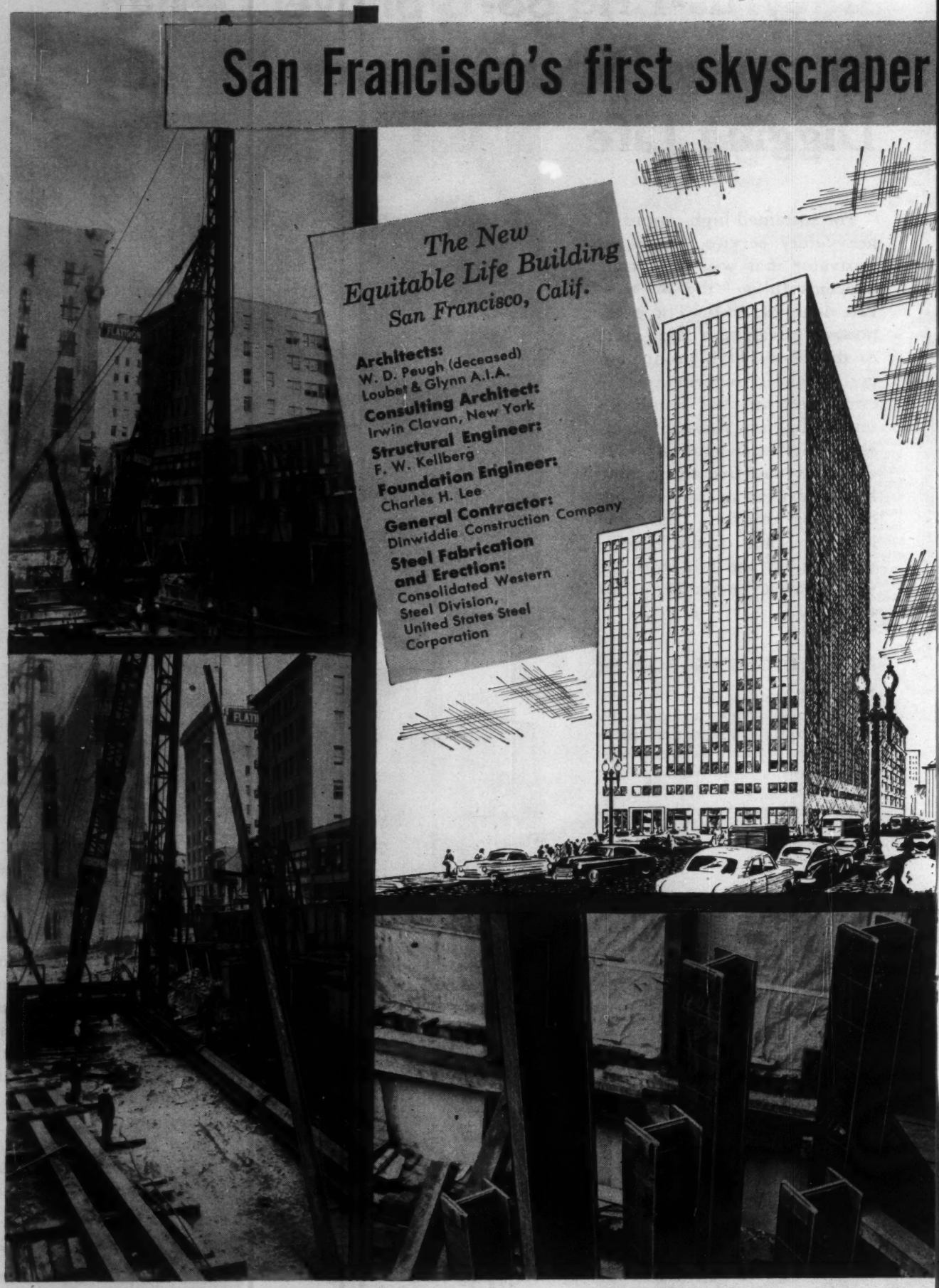
YEARS OF SERVICE to Men Who Shape the Earth

San Francisco's first skyscraper



built under rigid earthquake code

securely founded on

467 USS H-BEAM BEARING PILES

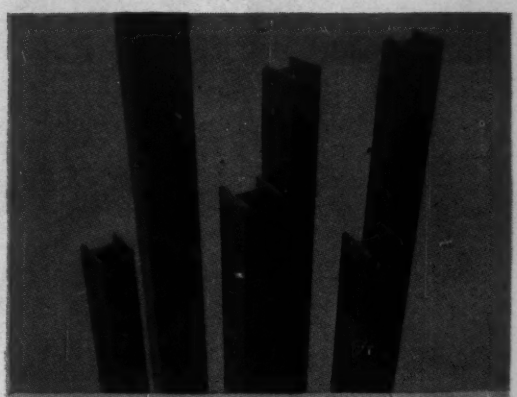
driven 132 feet to bedrock!

The new 25-story, temblor-resistant Equitable Life Building now nearing completion in San Francisco is the first skyscraper to be built there since the enactment of that city's rigid earthquake code in 1948.

Standing on steel piles extending 132 ft. below street level, it is also San Francisco's first tall building with steel foundations resting on bedrock.

To provide the firm foundation necessary for a structure of this size, 467 USS H-Beam Bearing Piles (14 in.) were driven to refusal in hard rock, at depths ranging from 107 to 133 feet below basement level. The piles were designed for an allowable load of 135 tons.

Thus, steel again proves the answer to a city's construction problems. For it was generally believed that restrictions imposed by the code would bring an end to skyscraper construction in San Francisco.



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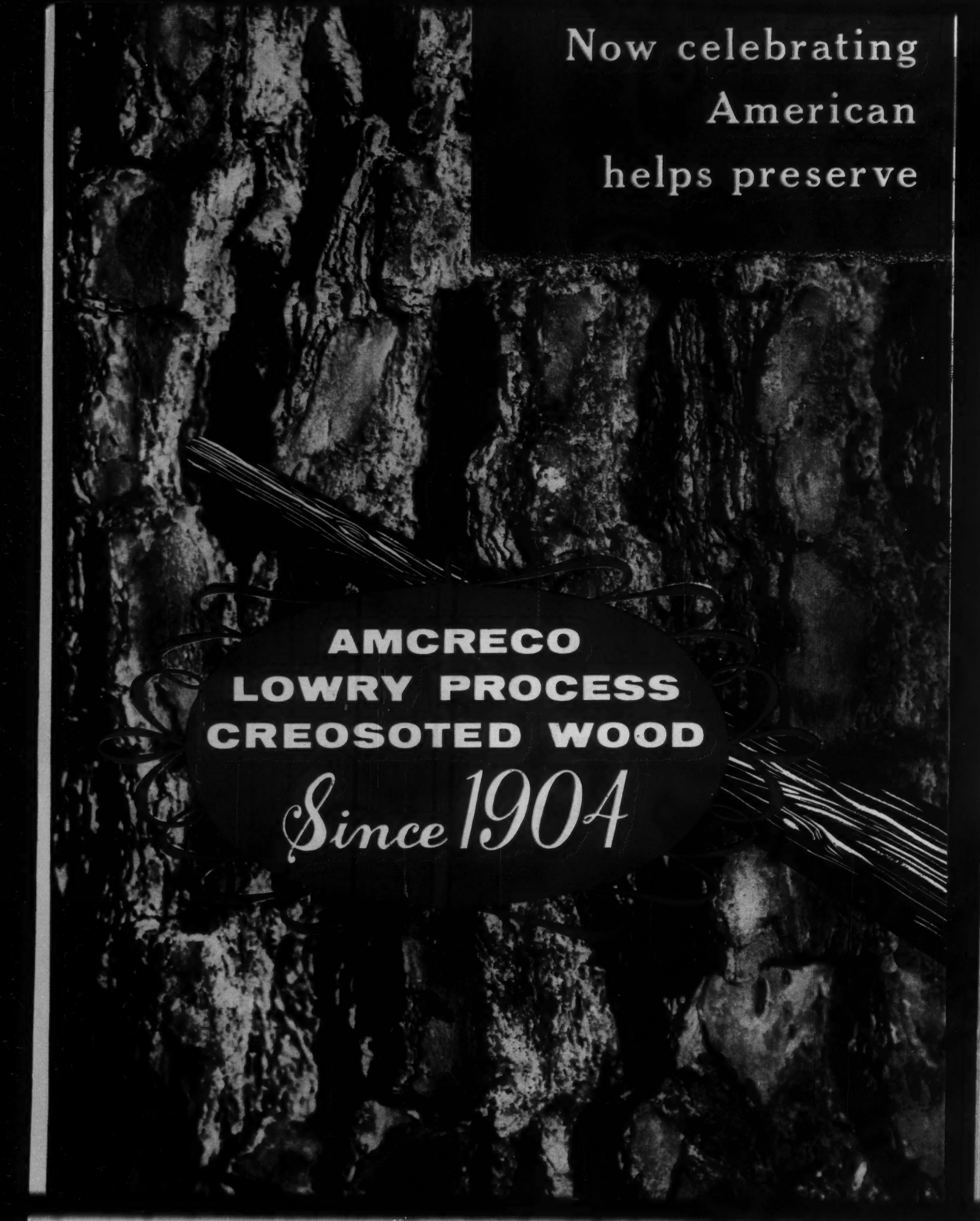
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Since 1904

its Fiftieth Anniversary, Creosoting Company an American Heritage . . .

. . . *our Vital Forest Lands*

At one time, more than half our country was covered with trees useful for construction material. And it is said, that without this abundant supply of wood, our country would yet be much less developed. Railroads for example, which were a principal factor in the development of our country, could not have been built with such outstanding speed if it had not been for a readily available timber supply.

The time came, however, when the supply of timber was not so readily forthcoming and able men, among them Gifford Pinchot, became pessimistic as to the future of our forests. Around 1900, it was predicted that our timber lands would be exhausted in another 25 years if we continued as we were.

Then, just when the picture looked blackest, Mr. C. B. Lowry introduced his Empty Cell Creosoting process and the modern era of wood preservation was born. It has been estimated that the modern wood preserving industry, founded by Lowry and pioneered by the American Creosoting Company, has saved the nation the equivalent of 500 million acres of forest in the past 50 years.

What does this mean to the nation and to you? It means that we are no longer faced with the prospect of becoming a treeless nation. It means that our once teeming timberlands have had a chance to recover from the abuses of the past. Wood preservation, along with the development of scientific forestry and use of substitutes for wood as a construction material, have turned the tide against the forces of forest exhaustion.

In addition to helping save a great natural resource, wood treatment means one other thing to you. It means longer lasting service life for every piece of wood that you use. For example, wood treated by the American Creosoting Company lasts four, five, even ten times as long as untreated woods. In fact, under many conditions, wood treated by Amcreco can be considered essentially permanent.

Of course there are many different types of treatment processes—some tried and proven—others as yet untried by the big test of time. For that reason, when investing in treated woods, make sure you know their service record before you buy.

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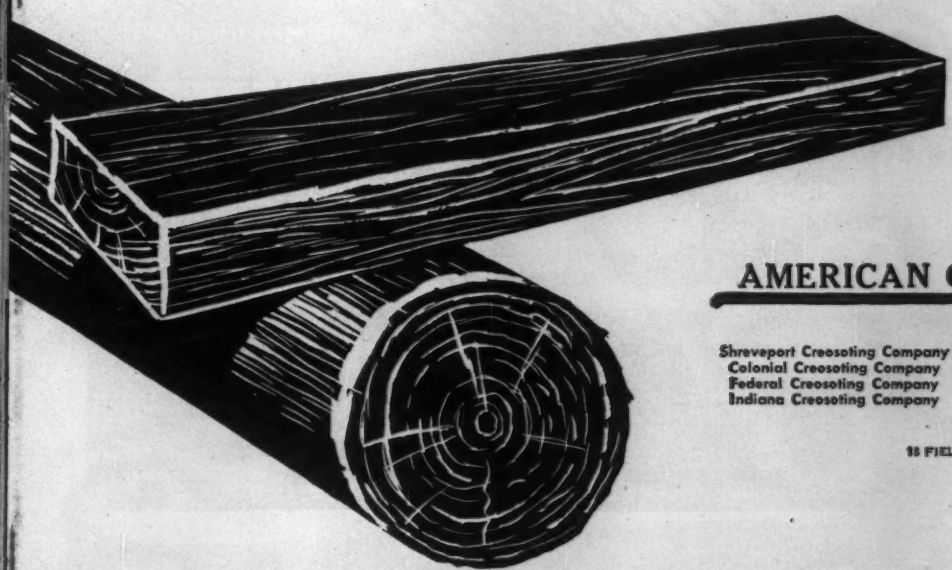

This year the United States Forest Service also celebrates its 50th anniversary. We are proud to share our birthday cake with them and to join the nation in thanking them for their invaluable contributions to conservation.

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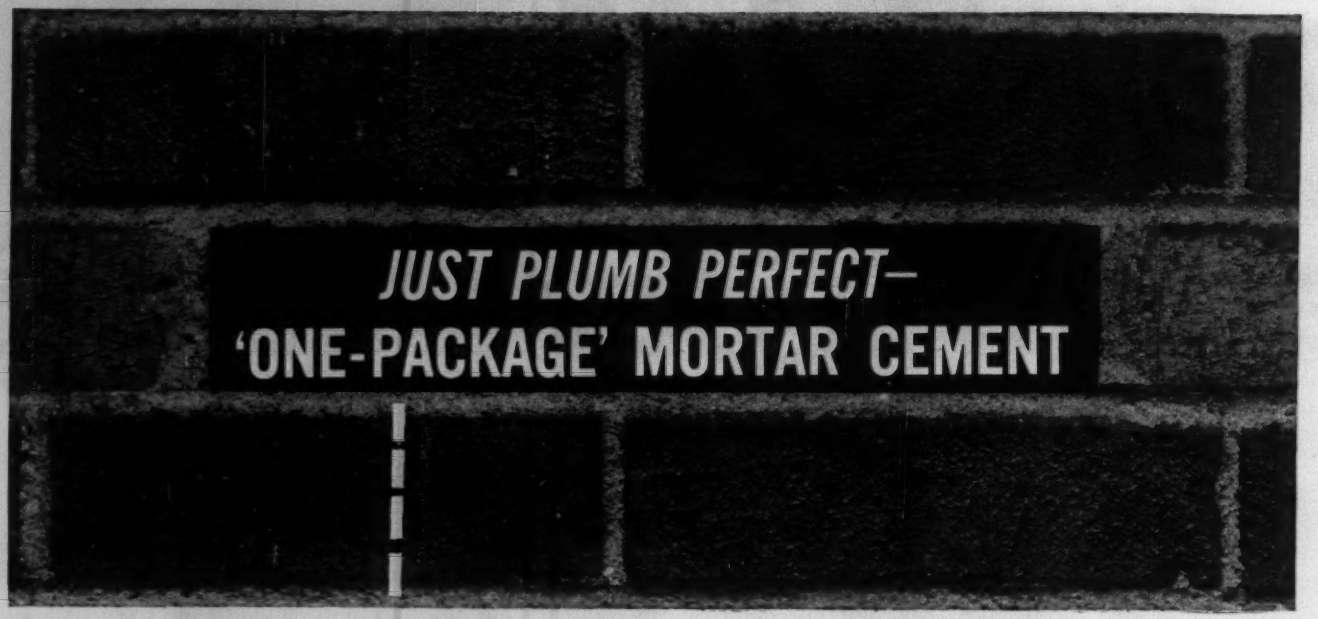

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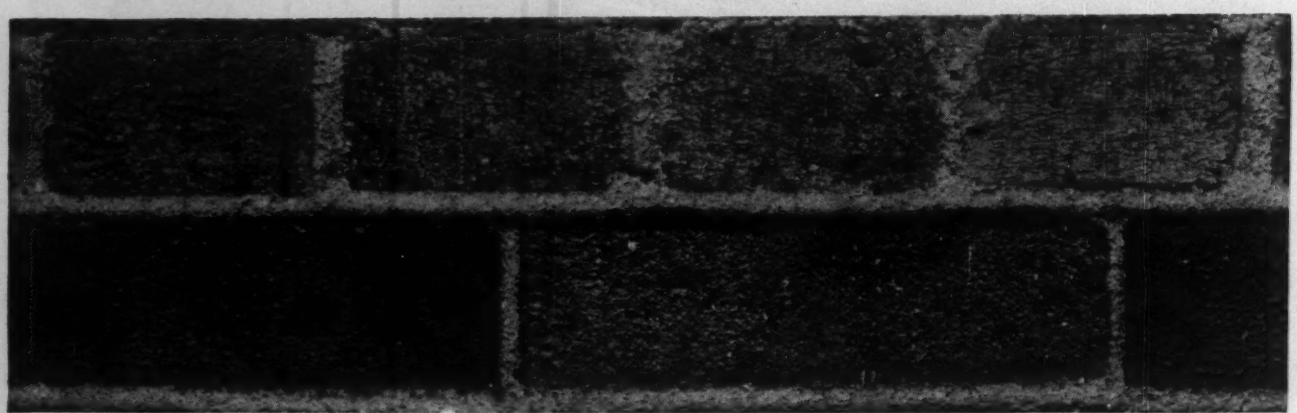

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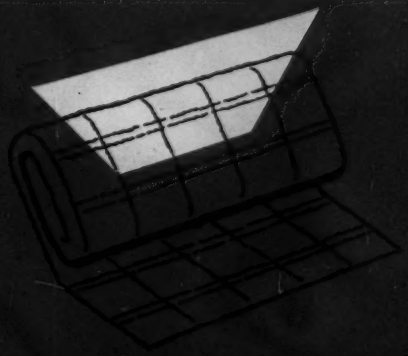

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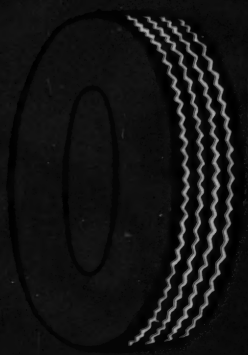

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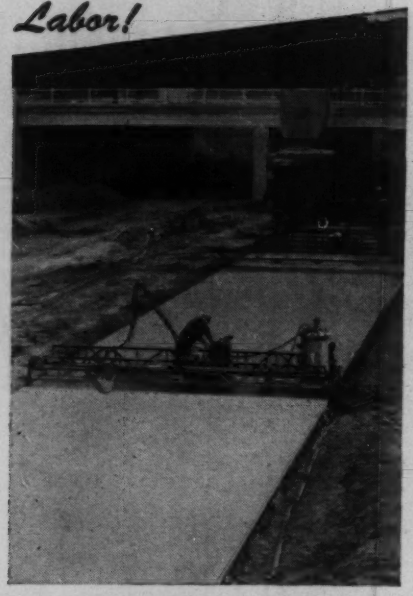

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READER COMMENT

Use of Wellpoints at Miami

SIR: The first two and last paragraphs of your editorial, "The Right Tools for the Job" (ENR, April 7, p. 132) were excellent. There is no truer statement than your opening phrase, "No two subsurface jobs are exactly alike".

However, the statement that "Miami experience has shown that wellpoints alone generally cannot do the job there" is not true, from a general view of this area.

The Miami oolite has been successfully dewatered numerous times with wellpoints alone. It is only when the oolitic layer (20-30 ft thick) has been penetrated and the effects (pressure and large flows) of the lower components of the Biscayne Aquifer, the Ft. Thompson Formation and Tamiami Formation are encountered that unusual dewatering problems develop. The sand which overlies the Miami oolite, in some places to a depth of 60 ft, also is very easily dewatered by wellpoints alone and the use of a tremie-seal and sheeting would be uneconomical.

Our experience in the Miami area indicates that the sheet piling tremie-seal method of construction is rapidly bowing to wellpoints. In fact, few subsurface jobs in this area are estimated without the consultation of wellpoint engineers. At present, one contractor is constructing two underground structures in the same area and formation—one by the wellpoint method, without aid of sheeting, grouting, or any other aid. (This structure was started first and was completed in the dry), and the other by means of steel sheeting and tremie-seal to determine actual construction costs by comparison.

In the Miami area, the important factor is correct and sufficient boring data as to the material to be dewatered. Too often, the engineer designs and the contractor estimates subsurface work on the basis of improper or no exploration. The greatest mistake in the Miami area is to make one boring or to evaluate the subsurface on the basis of a previous job several blocks away.

To reiterate, while the overlying sands and the Miami oolitic limestone do vary in water bearing characteristics and hence dewatering requirements, they can be, have been, and are being dewatered economically by wellpoints alone. Underlying the oolite layer are strata more difficult to dewater. Better boring information will eliminate many of the present "unexpected conditions" that usually develop.

BYRON J. PRUGH
EUGENE P. SIMCIC
Moretrench Corporation
Miami, Fla.

Author Misquoted

SIR: In the March 17 issue of ENR, p. 24, there is a report upon the meeting of the American Concrete Pipe Association in Boston. At that meeting the writer gave a paper on our experiences in the use of concrete pipe.

Certain statements which were made by the writer in his address at that meeting were misquoted in your news report. This resulted in some unfavorable comments. I am referring particularly to the paragraph on the West Virginia Turnpike. The firm of Fay, Spofford & Thorndike was not called in as consultant after damage to some culverts and cattle passes had been discovered. It was engaged to design a section of the West Virginia Turnpike. Another engineering firm was the consulting engineer. The damaged pipes were investigated by a third party.

The 97-in. x 97-in reinforced-concrete flat-base pipe was not installed with cover ranging from 3½ to 50 ft. Drain pipes, in general, had this cover.

F. M. CAHALY
Fay, Spofford & Thorndike
Boston, Mass.

CALENDAR

National Rivers and Harbors Congress, national convention, Mayflower Hotel, Washington, D. C., May 30-June 1.

National Society of Professional Engineers, annual meeting, Bellevue Stratford Hotel, Philadelphia, June 2-4.

Construction Industries Exposition and Home Show, Pan Pacific Auditorium, Los Angeles, Calif., June 9-19.

American Water Works Association, convention, Conrad Hilton Hotel, Chicago, June 12-17.

Sixth Hydraulics Conference of the Iowa Institute of Hydraulic Research, State University of Iowa, Iowa City, June 13-15.

American Society of Civil Engineers, Spring convention, Hotel Jefferson, St. Louis, June 14-17.

The American Institute of Architects, annual convention, Hotel Radisson, Minneapolis, Minn., June 20-24.

American Society for Engineering Education, annual meeting, Pennsylvania State University, State College, Pa., June 20-24.

American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 26-July 1.

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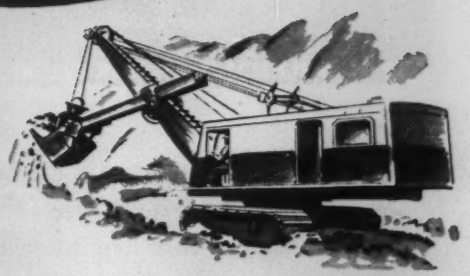

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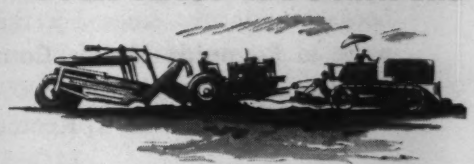

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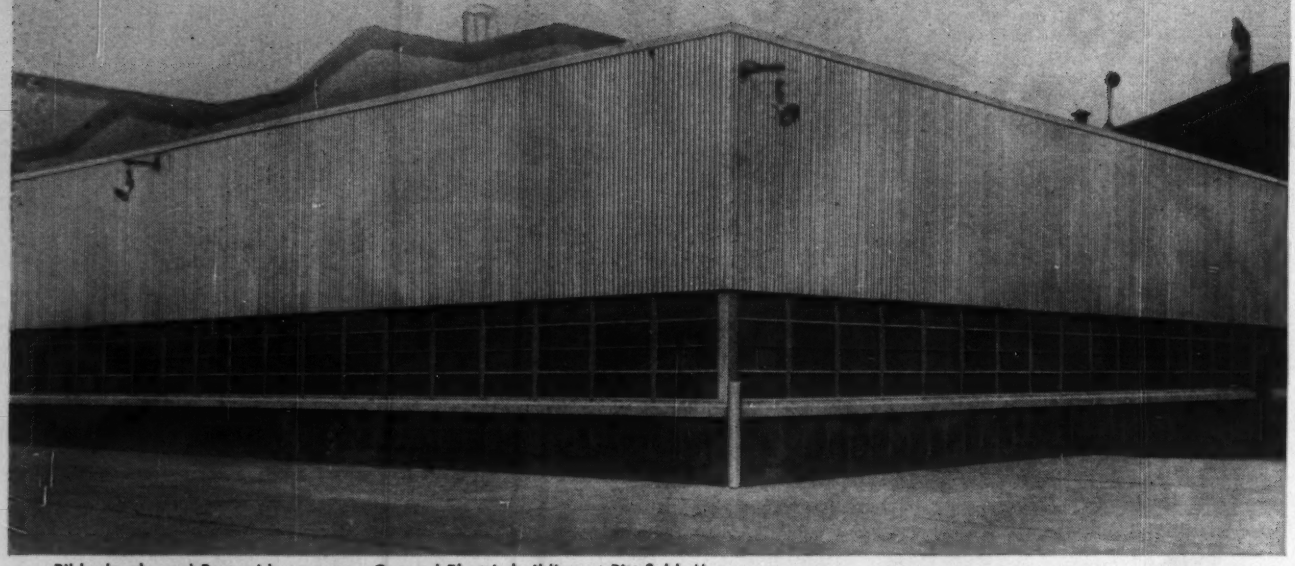
Reynoside



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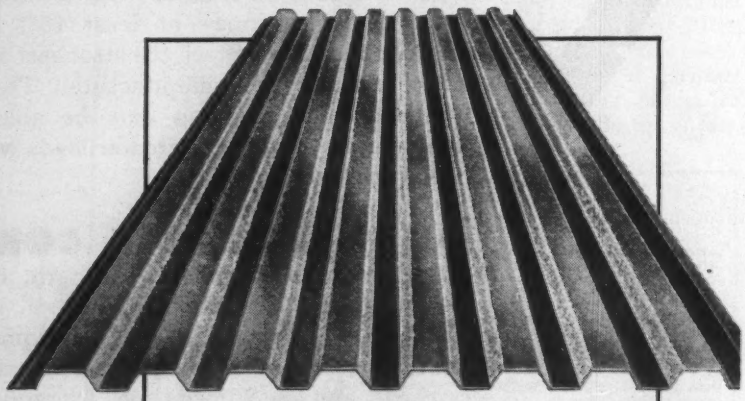
A complete installation service is available. For name of nearest jobber-erector, call the Reynolds office listed under "Building Materials" in classified phone books of principal cities. For literature, write to **Reynolds Metals Company,** Building Products Division, 2009 South Ninth Street, Louisville 1, Kentucky.



Reynoside Specifications:
Three Types: (A) 4" rib, .032" thick. (B) 8" rib, .032" thick. (C) 8" rib, .040" thick. Rib depth, 1". **Finish:** stipple-embossed. **Lengths:** from 5' to 14' 5½". Special lengths to order. **Width:** 41⅝" over-all; nominal coverage 40". Weight per square: (A) 59.4 lbs. (B) 53.1 lbs. (C) 66.4 lbs.

REYNOLDS ALUMINUM
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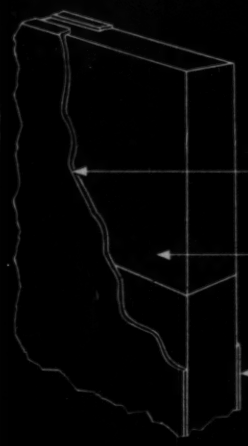

Architects: Kivett & Meyers, A.I.A.
Angus McCallum, A.I.A. Associate
Kansas City, Mo.

Panel Fabricator: Barrows Porcelain Enamel Co.
Cincinnati, Ohio

General Contractor: Frank Quinlan Construction Co.
Kansas City, Mo.

Light-weight, waterproof FOAMGLAS proved ideal insulation for curtain wall panels at Douglass Elementary School, Kansas City, Missouri

Light-weight and waterproof, FOAMGLAS proved to be the ideal insulation for prefabricated curtain wall panels used on the new Douglass Elementary School, Kansas City, Missouri. This unique cellular glass insulation used as the core of porcelain faced panels for the new School, has been a major factor in making them a success.

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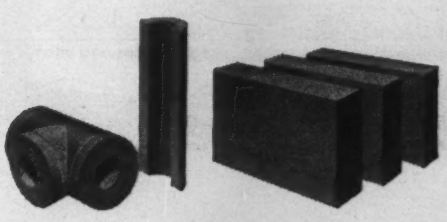
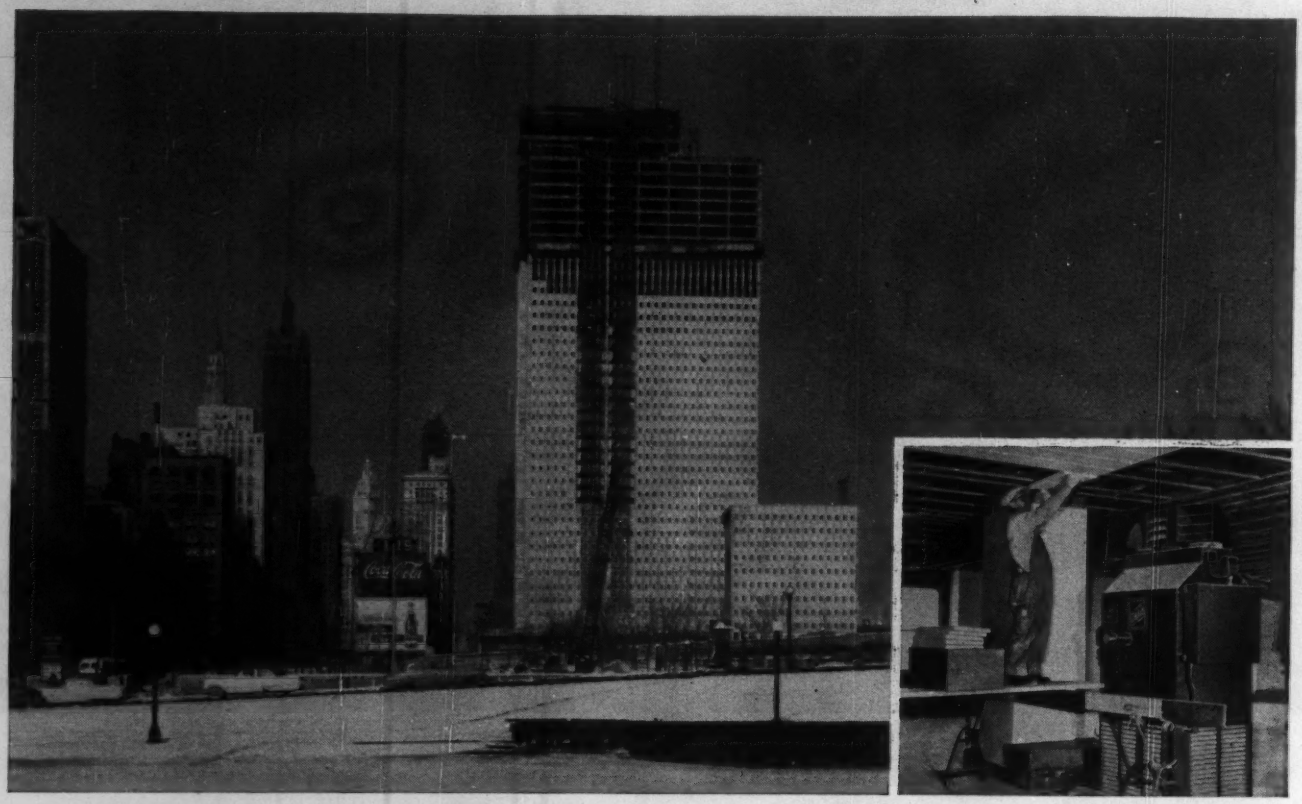


Pittsburgh Corning also makes PC Glass Blocks



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How to maintain satisfactory temperatures during the four months of Chicago's rugged winter was the problem George A. Fuller Company faced when planning construction schedules on the new 41-story Prudential Mid-America Office Building.

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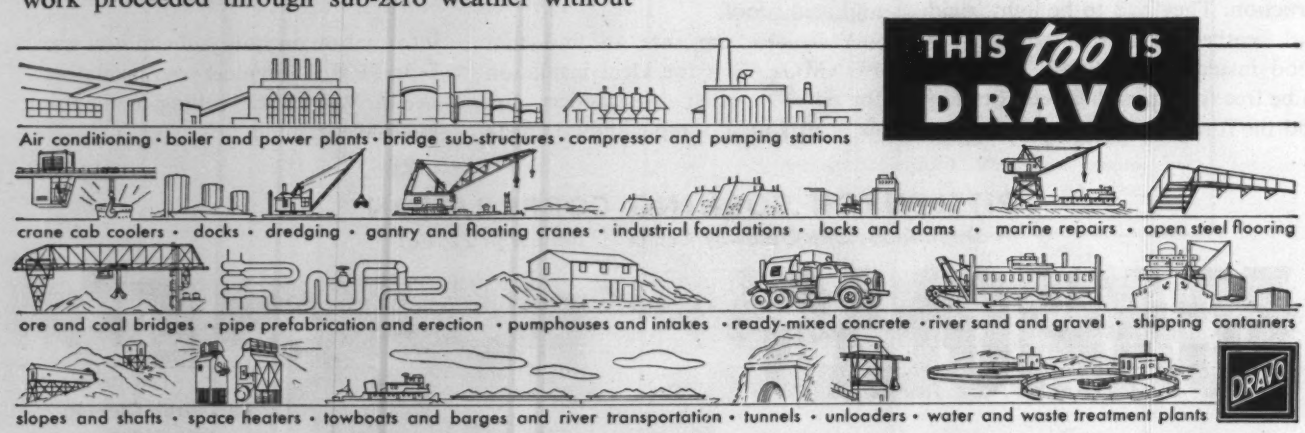
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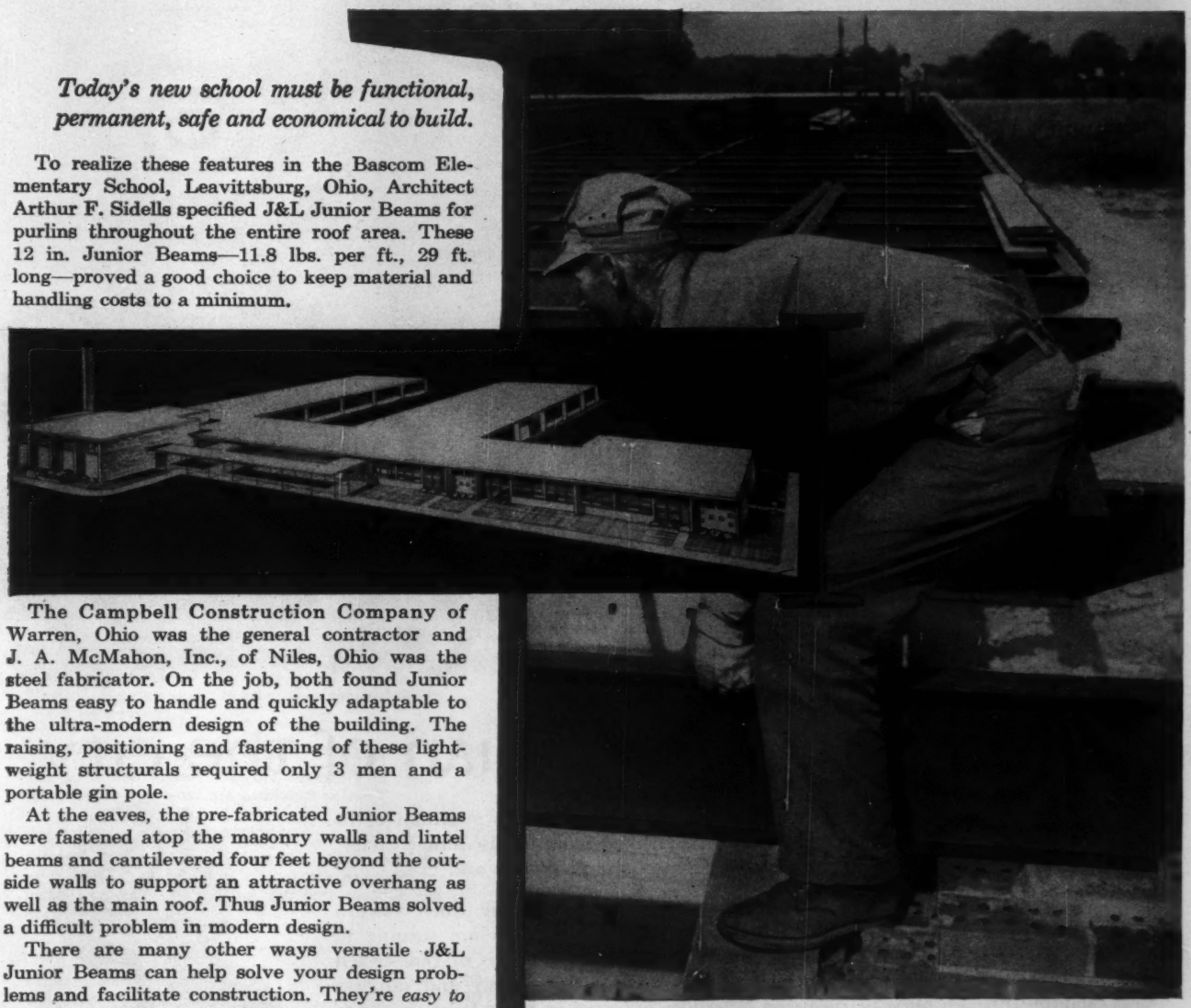

Today's new school must be functional, permanent, safe and economical to build.

To realize these features in the Bascom Elementary School, Leavittsburg, Ohio, Architect Arthur F. Sidells specified J&L Junior Beams for purlins throughout the entire roof area. These 12 in. Junior Beams—11.8 lbs. per ft., 29 ft. long—proved a good choice to keep material and handling costs to a minimum.

The Campbell Construction Company of Warren, Ohio was the general contractor and J. A. McMahon, Inc., of Niles, Ohio was the steel fabricator. On the job, both found Junior Beams easy to handle and quickly adaptable to the ultra-modern design of the building. The raising, positioning and fastening of these lightweight structurals required only 3 men and a portable gin pole.

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ENGINEERING NEWS-RECORD

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THE CONSTRUCTION WEEK

TAX CONCESSION OUT—Prospects for construction of a $75-million business center in Boston suffered a setback, as result of a ruling that tax concessions proposed as necessary to attract financial support for the project would be "unreasonable" and "unconstitutional."

Back Bay center was seen as a means of adding at least $50 million to Boston's shrinking tax base by a special commission that advocated the tax concession plan (ENR Feb. 3, p. 28), on which the legislature had requested the State Supreme Court to render an advisory opinion.

Bitterly disappointed over the ruling, Mayor John B. Hynes termed the proposed tax offer as "no more than concessions made every day by surrounding cities and towns to Boston's detriment."

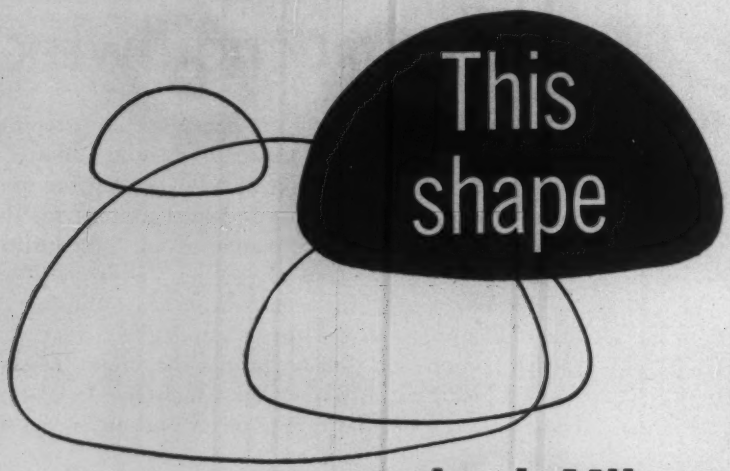
DELAWARE OBJECTS—The New Jersey State Senate threw something of a bombshell across the Delaware River last week. It passed a measure that calls for Delaware to pay annual license fees on land utilized for the N. J. approaches to the Delaware Memorial Bridge. Fees would go to Salem County and the municipality of Deepwater. And, just for good measure, the bill requires the attorney general to bring action if Delaware doesn't pay up.

The law was prompted by a Delaware proposal to continue tolls on the bridge beyond bond retirement. It would stay in effect as long as tolls were collected. And, while it may have looked like just another legislative "rhubarb" when introduced, the bill's 19-0 approval by the N. J. upper house came as a jolt to Delaware officials.

Delaware built the bridge itself because Colonial surveyors fixed the N. J.-Del. boundary at the N. J. low water mark. And, some sources on the Delaware side are now saying there are some N. J. properties extending beyond that boundary that would bear examination.

EXECUTIVE PREROGATIVE—An interim legislative committee, in which Colorado legislators sought to invest power to dictate construction projects at state institutions, has had its wings clipped. According to a ruling by the state's attorney general, this amounted to the legislature adopting a law and then creating from its members a committee to execute it. "Nor can the legislature delegate to a committee the power of performing legislative functions," the opinion stated.

Issue arose when Gov. Ed C. Johnson was reluctant to authorize a new structure at Canon City state prison because he had reason to expect that the committee would order it to be located at another site and he was opposed to a separate penal institution.



solved Milwaukee's sewer problem

The problem was to enclose an open storm sewer, yet retain adequate waterway under the limited headroom available. A single round pipe of the right capacity would not fit the headroom, and a multiple installation of smaller pipe would add to expense.

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Armco Sewer Structures

WASHINGTON OBSERVER

The government is welcoming the tightening in housing credit. And if consumer demand for housing fails to level this summer, some direct controls on mortgage credit will be seriously considered.

General credit tightening has had its effects on housing already. But the Administration and economic experts in Congress are worrying that money may get too tight all around if general restrictions are used to get at housing.

The White House would like to convince Congress that the President should be given authority to juggle down payment and interest rate regulations to meet either too much boom or too much downturn in housing construction. Eisenhower and the Federal Reserve Board like this method better than a return to the Regulation X of the Korean mobilization.

But Congress is still not ready to take new action. A new housing bill—minor revision legislation—is being considered now by the Senate Banking Committee, and no restrictive provisions will be approved. The staff of the Joint Committee on the Economic Report, however, has advised congressmen that it may be well to consider specific housing restrictions.

You can expect that if a decision to put on restraints comes, it will be first in the field of down payment and interest rates rather than a new Reg. X.

•

Future of fast tax amortization as stimulator of new plant construction is being reviewed by Office of Defense Mobilization. Fast tax amortization helped build billions of new industrial capacity after the Korean war began.

Now this tax incentive isn't enough to help many industries that the government would like to see grow.

New expansion is likely to be called for in aluminum and oil refining. Government officials figure that booming consumption today means surefire shortages for civilian use during wartime.

•

Home owners can get FHA insurance on loans to build bomb shelters either the kind that's built in the basement or detached from the house.

Civil defense officials are encouraging such construction and local offices have plans for several types.

Loans are insured as home improvements under Title One or under the open-end provisions which allow an addition to the regular mortgage on the house.

•

Financing methods remain the big bottleneck to highway legislation. The Senate and House both (see page 21) want to vote for additional highway construction—and they both want to give higher priority to the interstate system.

Question is: What kind of new revenue measure to offset new spending by the federal government, at least in part?

House committee is studying two ideas for new taxes. An increase in the federal gas tax already has been discussed; the Senate Roads Committee recommended a one-cent boost. The House may suggest an even higher increase.

One new idea is to make trucks pay more since they use the highways more. This would be done by putting a special tax on truck tires. The thinking is to make it a manufacturer's excise on top of the 5% the government now collects on the manufacturer's price of all tires for highway vehicles.

Some increase in highway user taxes seems certain to be recommended. Both houses want to make the program as much "pay-as-you go" as possible. But all tax measures must get through two other committees—the House Ways and Means and the Senate Finance Committee.

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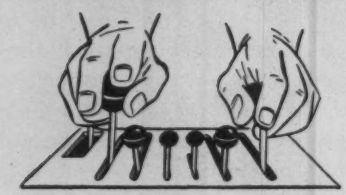

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Major Legislation in Congress Runs Into Trouble:

- **Highways—Differences between the Senate and House versions of new federal aid legislation may block action**
- **Power—Democrats still refuse to support any of the "partnership" projects the Administration is pushing**
- **Water projects—The Administration program is making some progress, but Democrats have their own program**
- **Schools—The segregation issue has blocked progress of both Administration and Democratic school aid bills**
- **Military—This is a bright spot. Hearings are under way, and so far there has been no serious opposition**
- **Housing—The Administration is asking for 70,000 public housing starts. It could get either more or less**

Politics Slow Action on Construction Bill

The heavy bundle of construction legislation that President Eisenhower's Administration proposed to Congress has run into heavy weather on Capitol Hill. It's a good bet now that none of the Administration's major proposals, with the exception of the $2.4 billion military construction bill, will get final Congressional approval this year.

The big reason is politics. By and large, both Democrats and Republicans in Congress agree that the federal government must act to stimulate construction to meet the nation's growing needs for highways, schools and natural resource development.

Where members of the two parties disagree is over how to go about working toward these goals. And, with a Presidential election coming up next year, these differences are sharp.

But there is a brighter side to the outlook, too. Almost all of the major construction measures are now in a position to clear one house or the other before congressmen go home this summer. And they will be carried over for consideration in the session that will begin next January.

• **Highways**—In the Senate, a floor battle got under way this week over new federal highway legislation. Democrats pushed aside President Eisenhower's 10-year, $101-billion road-building plan in committee and substituted a five-year plan calling for a total outlay of $18 billion, of which the federal share would be $12.6 billion.

Republicans hoped to substitute the Administration measure during the debate, but they faced an uphill fight. A Senate setback, however, would not mean the end of the Administration bill. The House Public Works Committee now is considering four highway bills, all similar to the Administration approach. And the House committee does not have before it anything like the measure the Senate took up.

Prospects were that a larger federal highway program eventually would emerge. But the differences between the measures under consideration in the Senate and in the House made it likely that no compromise could be easily and quickly reached. It appeared probable that highway legislation would be carried over to next year's session.

• **Power**—At the center of the political battle over new power projects is the Administration's "partnership" concept. The Administration is emphasizing "partnership" in all new and pending power proposals. It is insisting that private utilities and state and local governments should share with the federal government the responsibility for developing hydroelectric resources.

The Democrats have refused to endorse any partnership proposals. They plan to make the issue a feature of their campaign next year. They will charge that the partnership approach is a technique to slow down and stall off project development and will attempt to show that little or no power has been produced by partnership projects.

Last week the Administration tossed a new partnership plan into the hopper. It proposed partnership construction of the $220 million Yellowtail Dam on the Big Horn River in southeastern Montana, right in the backyard of Sen. James Murray, Montana Democrat who is chairman of the Senate Interior Committee and a leader in the fight against the partnership concept.

Pacific Power & Light Co. and Montana Power Co. are drawing up details of a plan under which they would put up about $86 million and the federal government about $134 million to build a 200,000 kw power plant, switchyard and transmission facilities.

The companies already have submitted their basic plan to the Interior Department and to Congress. Under Secretary of Interior Clarence Davis has notified the Senate Interior Committee that the department will favor partnership over federal construction.

Three other partnership proposals, all formerly authorized as federal projects, are pending before Congress. They are the $310 million John Day Dam on the Columbia River, the $37 million Cougar Dam and the $58 million Green Peter projects in Oregon. Democrats are not keen about partnership construction of any of the three, and their control of Congressional committees makes it highly unlikely that any will win approval this session.

The Democrats are concentrating on legislation to authorize the controversial Hell's Canyon power project on the Snake River as a federal project. A Senate Interior subcommittee is delaying a vote on a bill sponsored by more than 30 Democratic senators which calls for federal construction of a single high dam there. Hope is to get unanimous approval of the federal project.

Earlier, an examiner of the Federal Power Commission recommended that the Idaho Power Co. be licensed to build a single low dam—one of the three the company requested permis-

. . . Politics slow action

sion to build—at the Brownlee site. The FPC is not expected to act on this recommendation until late in the fall—after Congress will have had time to act.

• **Water projects**—The Administration's program of reclamation and other water projects is moving slowly through Congress, but Democrats are pushing a program of their own that could provide an issue for next year's political campaign even if it fails to gain Congressional approval.

The Administration's big natural resource project, the $1.5 billion Upper Colorado River Storage Project, has passed the Senate and now is before the House Interior Committee. The House almost certainly will knock out the controversial Echo Park project so bitterly fought by conservationists and may attempt to restore some other projects killed by the Senate. The result might well be that the entire measure is carried over for consideration next year.

The other big Administration project is the $156 million Frying Pan Arkansas Water Diversion Project in Colorado. This bill has been reported by the Senate Interior Committee. It faces its toughest battle in the House where it was turned down last session.

Regionally sponsored legislation, like the $225 million Trinity River Project in northern California and the Washita Basin Project, a $40 million flood control and municipal water project in Oklahoma, have received committee approval and stand a slim chance of clearing all Congressional barriers this year.

• **Schools**—School construction legislation is stopped for the time being in both houses of Congress by the segregation issue. Sen. Lister Hill of Alabama, chairman of the Senate Labor Committee, has been the prime mover in the Senate behind a big program of federal aid, but the introduction of the segregation issue has placed him in an awkward position.

On the House side, advocates of federal aid bills accuse Rep. Graham Barden, chairman of the Education and Labor Committee, of conducting a "stretch-out" of hearings on the legislation. Hearings have been going on for two months now, and Rep. Barden is said to favor continuing them.

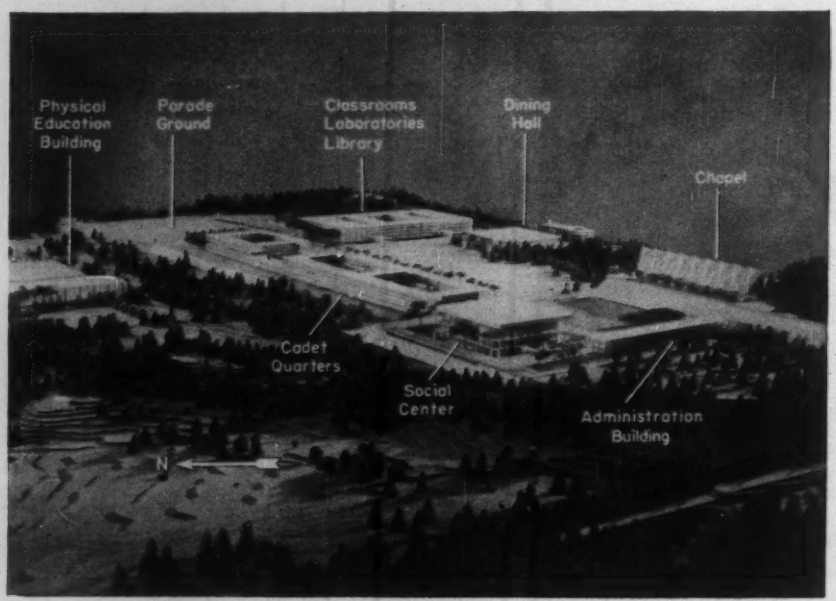
A show-down may come soon. Rep. Cleve Bailey, Democrat of West Virginia, is reported ready to push for committee action. He is the author of a bill calling for the federal government to match whatever the states are willing to put up with a minimum of federal regulation.

• **Military construction**—Hearings on the $2.4 billion military construction bill got under way early in May and are scheduled to continue through this month. So far, Congressional committees have made few cuts in the budget requests. In a few cases, they boosted the amounts requested. There is little politics involved in the measure, and chances are it will pass Congress this year without any major changes.

• **Housing**—The Banking Committees of both the House and the Senate have begun hearings on Administration proposals for an added batch of 70,000 units of public housing during the next two years.

Chances are good that Congress this year will approve at least the 70,000 new public housing starts the Administration requested. There is some strong opposition to public housing in both parties, but most Republicans and some Democrats are expected to stand behind the Administration bill.

Some Democrats will argue for more than the President asked. Sen. Herbert Lehman, New York Democrat, has introduced an amendment to the Administration bill which would increase the number of authorized new starts to 135,000 in the next two years.



Construction of Air Force Academy to Begin

The Air Force is ready to get construction started on its $126-million academy. Bids on the first contract were scheduled to be opened this week, and actual construction will get under way in June (ENR May 5, p. 21). Buildings of the academic area are grouped at the northwest corner of the 17,500 acre site near Colorado Springs, Colo. The airfield will be at the southeast corner, near the supply area.

State Road Board Unveils New Miami Expressway Plan

Florida's State Road Board has recommended a $150-million expressway plan to solve Miami's downtown traffic and parking problems for the next 20 years.

The new proposal, a result of five years of research and traffic study, combines the best phases of plans and surveys made by Miami, Dade County and engineering firms. It calls for a system of eight-lane, inter-connected elevated and graded expressways or parkways to speed traffic crosstown as well as through the heart of the city.

One feature of the plan is a single high-level bridge running into Biscayne Bay and linking Biscayne Blvd. with the Venetian and MacArthur causeways to Miami Beach. Another highlight is an elevated expressway that will span the Florida East Coast Railroad tracks and connect with Rickenbacker causeway to Key Biscayne.

Spur elevated links would connect with major cross streets, where drive-in parking garages could be erected at the first floor level. It's estimated that these garages could provide parking for 15,000 cars.

The question of how the $150 million will be raised has not been answered. The road board reportedly hopes that most of it might be obtained from the federal government if it can be shown that the expressway would qualify as part of the inter-state highway system.

AGC Opposes Bill

Rooney charges measure to restrict bid shopping would lift building costs

A spokesman for Associated General Contractors of America told a Senate subcommittee last week that proposed legislation to restrict bid shopping on federal construction contracts would "tend to encourage unethical business relationships" in the construction industry.

Frank J. Rooney, Miami building contractor and AGC's vice president, made a strong case against the bill in the final day of hearings before a Senate judiciary subcommittee. At an earlier hearing, a number of specialty subcontractors testified in support of the bill (ENR May 19, p. 25).

Rooney said the proposed restrictions on bid shopping would add to the cost of construction and work hardships on the very subcontractors it is supposed to help. He said improvement of ethics in the construction industry must be brought about by joint cooperative efforts by both generals and subs—not by government.

"We do not believe it is possible for Congress, or any other legislative body, to devise legislation which will improve the morals of this industry, or any other industry," Rooney said.

"As we see it, the bill would only change the ground rules for those relatively few subcontractors and general contractors who have an inclination to enter into shady agreements," he said. "There is nothing in the bill, for example, to prevent an unethical subcontractor from suggesting to a general contractor that he will do the work at less than any other offer made. Nor is there anything to prevent an unethical general contractor from suggesting that he will name a particular subcontractor if an agreement is made that the subcontractor will do the work for less than the lowest offer received."

Rooney said the bill would put general contractors in the position of having to guarantee the work of their subcontractors without a chance to assure themselves that the subs could and would do all the specified work at the offered price in the required time.

He also charged that the bill would increase the administrative burdens of the government "without benefit to the public." The bill, he said, "could very easily place the government in the position of referee in the family squabbles" of the industry.

Other construction industry spokesmen who testified against the bill included Robert A. Moyer of Charles H. Tompkins Co., Washington, D. C., R. A. Smith of the P. J. Walker Co., Los Angeles, and E. D. Hoekstra representing the National Constructors Assn. Henry Glassie, Washington attorney for the Electrical Contractors Assn., testified in support of the bill.

Last year the Judiciary Committees of both the House and the Senate reported favorably an even stronger bill to outlaw bid shopping on federal construction. The bills were dropped by both houses in the rush for adjournment. The Senate subcommittee this year is believed to be favorable to the bill.

American Engineers Picked For Big Project in Lebanon

A joint venture made up of the Harza Engineering Co. of Chicago and the Ralph M. Parsons Engineering Co. of Los Angeles has been engaged by the Lebanese government to do the engineering work for the first phase of a combined hydro and irrigation project on the Litani River in Lebanon. Cost of this first phase is put at $40 million.

Last fall, when the Lebanese government announced that it was seeking proposals for the engineering work on this project (ENR Nov. 18, 1954, p. 60), proposals were received from 40 firms in Europe and 14 in the U.S. (ENR Jan. 27, p. 82). Subsequently the number of engineering firms being considered was reduced to 15, of which five were from this country (ENR March 31, p. 63).

The first phase of the Litani River project consists of a dam 148 ft high and 3,300 ft long; two 8-ft tunnels, one 2,500 ft and one 3,000 ft long; two hydro power plants, one of 12,000-kw capacity and one of 39,000-kw; 75 mi of irrigation canals; and 75 mi of transmission lines.

Chicago Delays Bid Opening On Water Tunnel Contract

The opening of bids for the construction of six miles of large diameter water tunnels in Chicago—originally scheduled for May 20—has been postponed to permit the insertion of escalator clauses in the specifications. New bids will be called June 10.

The construction is part of the city's $85-million, 950-mgd filtration plant to be built on Lake Michigan just north of Navy Pier (ENR Apr. 28, p. 27). It includes 30,880 ft of 16-ft and 20-ft dia tunnel, 450 ft of smaller tunnels, seven work shafts and one bypass structure.

Revised construction specifications will include escalator clauses covering increases in labor rates and freight rates during the three-year construction period. There will be no escalator clauses covering materials prices.

Future Business

Non-federal public works need for next 10 years is put at $200 billion

The Department of Commerce has estimated that more than $200 billion of construction will be needed during the next 10 years to meet state and local public works requirements.

The department's estimate was based on the findings of a special survey, the first comprehensive study of its kind ever made. Officials of the Commerce Department's Building Materials and Construction Division say this is the first roundup of non-federal public works needs for a decade ahead.

To meet the estimated need, an annual expenditure of $20 billion would be required in each of the next 10 years. The total for the 10-year period is more than four times the cost of such facilities built in the past 10 years and compares with $8.6 billion in 1954, the peak year.

The $200-billion total includes $92 billion for highways, $41.5 billion for educational buildings, $22 billion for hospitals and institutions, $25.3 billion for water and sewerage works and $23.2 billion for other non-federal public works (excluding residential).

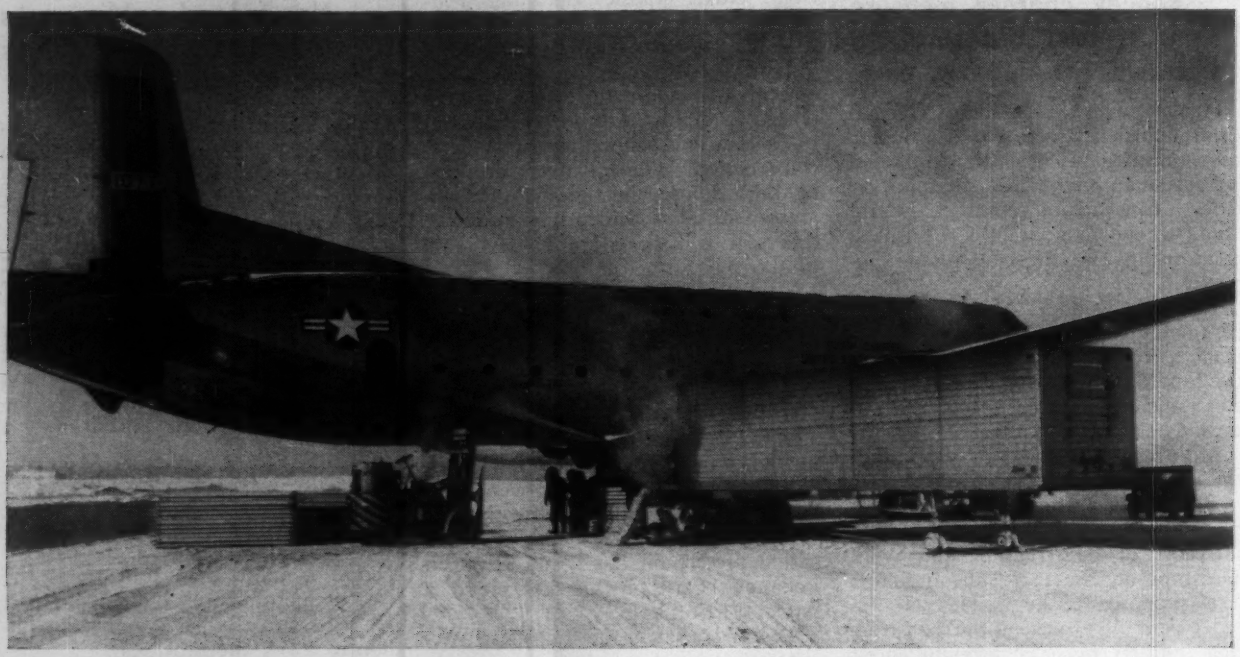
A considerable volume of this work has been "programmed," but the current ready-to-go projects, plus those in the design stage which are assured of completion, present a total substantially below the level of annual construction needed to meet the requirements for the next decade.

For example, the 71,639 projects in various stages of plan preparation by 4,000 state and local governments that reported on advance plans in a recent Census Bureau survey would cost $25.3 billion. These 4,000 government units accounted for four-fifths of all non-federal government construction in 1953.

This total of work planned is little more than the estimated $20 billion required for each of the coming years of the decade. And as of last October, only a third of the projects, representing $7.6 billion, were advanced to the drawing-board stage or beyond.

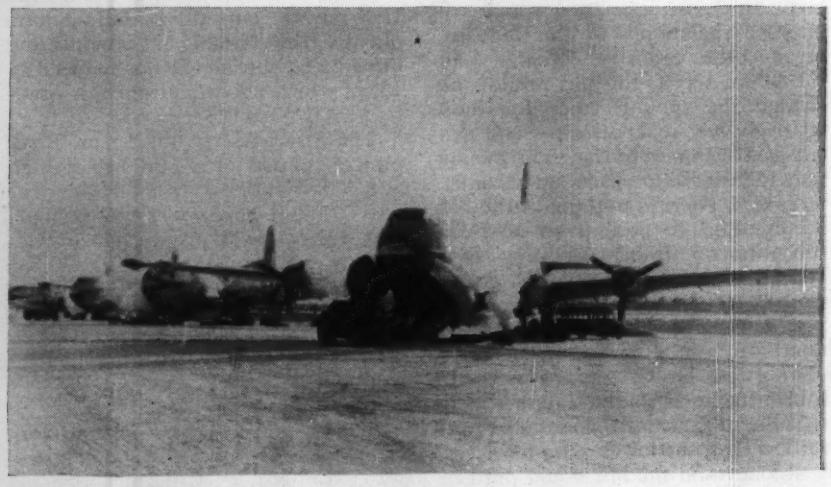
Some of the advance planning for state and local public works construction would not have been possible without federal assistance provided by Congress. As of June 30, 1954, some $1.8 billion of planned work in two programs assisted by congressional appropriations had not yet been started, and almost all of the $63.3 million of advance planning funds had already been used.

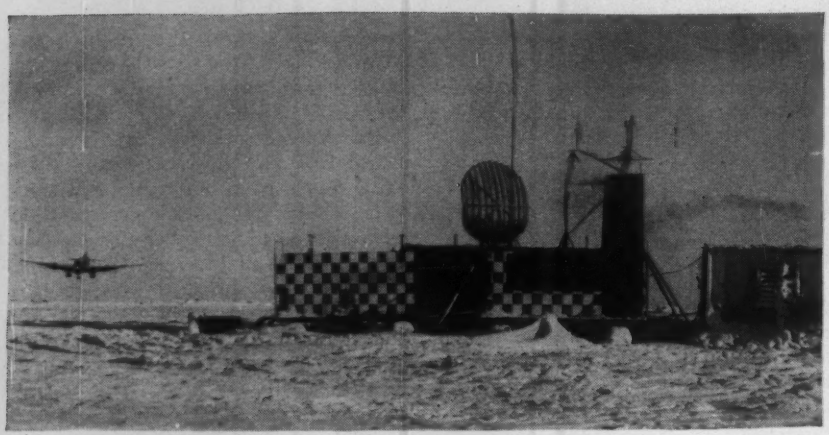
Arctic Airlift Helps Build Radar Warning Net



Plane loads prefabricated building components from a pre-packed truck van, shipped from the U. S. to Alaska by barge, for the Distant Early Warning (DEW) line radar stations across the northern rim of Canada and Alaska.

Heavy equipment like the 50,000-lb tractors (right), could be airlifted only by C-124 Globemasters, the Air Force's biggest operational transport. In the first phase of the airlift, these planes of the Tactical Air Command's 18th Air Force moved more than 6,600 tons of equipment and materials.





Radar beams guide the planes to landings at far north airstrips in temperatures as low as —57F. High winds and blowing snow often complicate the operation, but more than 330 landings on snow-covered airstrips were made in the first phase, called "Operation Big Haul."

Around the clock flights from Eielson, Ladd and Elmendorf Air Force Bases, the pick-up points to the northern airstrips in the first phase of the operation, flew over rough, snow-covered country. The planes now are flying from railheads at Edmonton, Churchill and Mont Joli, Canada, into remote and previously inaccessible points in the island network north of the Canadian mainland. In addition to equipment, the planes airlifted more than 1,200 30-ft timbers and quantities of pipe, plywood, insulation material and thousands of sections of barracks and other structures prefrabricated in Seattle, Washington, in "Operation Big Haul."

Tractor-drawn sleds move materials and equipment from the airstrips across sea ice to final sites. Some small prefabricated buildings were assembled at the airstrip and bolted to rounded timbers which served as sled runners for the last leg of the trip.

Private Funds May Back Study of Delaware River

With its impetus coming from Pennsylvania, where an earlier effort died, a new move to study resources of the Delaware River has started.

It began with a meeting between the governors of Pennsylvania and New Jersey to explore what might be done about the Delaware. With the four-state Incodel Plan dead, the governors and Mayor Clark of Philadelphia saw the need to re-evaluate development of resources of the Delaware.

First consideration—suggested by a feeling the Incodel Plan was not sufficiently multi-purpose—was the possibility of an interagency (federal-state) study such as those concluding in New England and the White-Red-Arkansas River Basin. This idea was shelved.

Then came the idea that Resources for the Future, Inc., a Ford Foundation subsidiary, might finance the re-evaluation.

Last week in Princeton, N. J., 17 representatives of Delaware, Pennsylvania, New Jersey, New York, Philadelphia and New York City met with two officials of Resources for the Future. These two officials reportedly advised that an organization of citizens, rather than a governmental group, would have a better chance at foundation financing for the proposed study. Something in the neighborhood of $250,000 is said to be sought.

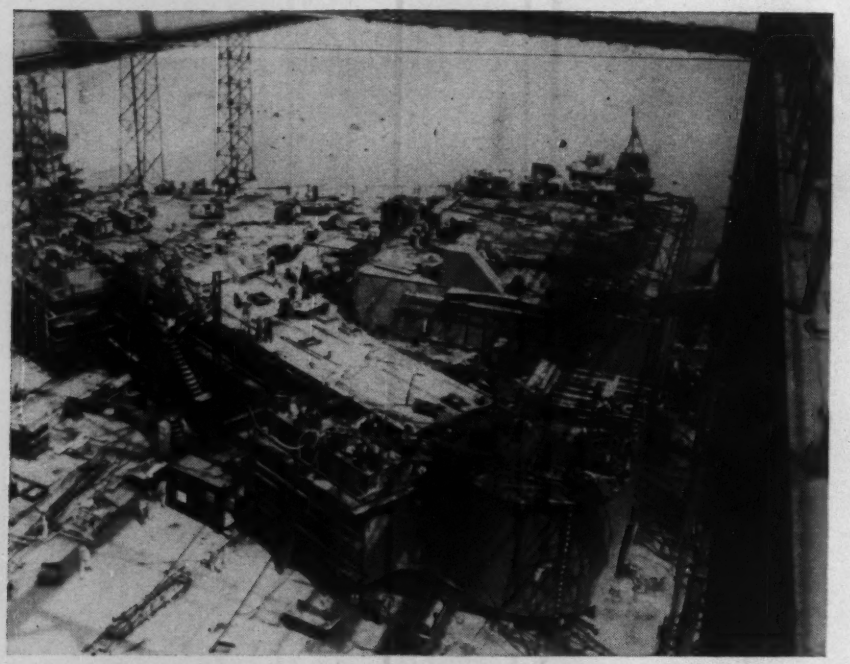
An ENR source reported that appointment of a special interstate board of citizens was decided upon. A comprehensive study is envisaged to include plans for storing and distributing Delaware River water after a survey of recreational, agricultural and industrial potential in the basin.

Corps of Engineers Calls Bids on New Alaska Base

The Corps of Engineers will open bids June 23 at Anchorage, Alaska, for construction of a complete military installation for the Air Force on Sitkinak Island, off the southern tip of Kodiak Island in the Gulf of Alaska.

Cost of the new station is estimated at more than $4.5 million. The project will include troop housing, outside utilities, technical facilities, roads, walks and an airstrip. A concrete composite building will house quarters, mess halls, operations office, recreation hall, storage, generating and heating units, and garage.

Sitkinak is the seventh in a chain of similar Air Force stations in Alaska. Contracts totaling nearly $20 million have been awarded for the first six stations (ENR May 12, p. 56).



First "Texas Tower" Launched

The first of the offshore radar platforms that will guard the northern sea approaches to the Atlantic seaboard of the U. S. was launched last week at Quincy, Mass., and towed to an outfitting pier. The structure, called a "Texas Tower" after the oil drilling rigs used in the Gulf of Mexico, will be towed out to sea and put in place about 100 mi east of Cape Cod in July. When it is in position, legs will be lowered through wells to the ocean floor, and air jacks will raise the 6,000-ton platform 87 ft above water level (ENR Nov. 25, 1954, p. 27).

News Briefs . . .

Airport Expansion

Construction of a 4½-mi dike—the first phase of the $11.5-million expansion of Oakland International Airport at Oakland, Calif.—is expected to get under way in July. The dike will enclose a 1,400-acre bay area that will be pumped out and filled for construction of a new terminal, operations and hangar areas, and an 8,600-ft runway. The entire program is expected to take 3½ years to complete.

Civic Center Plans

The Dade County, Fla., Civic Center, slated to go up on the site of the former Miami Country Club, is a step nearer construction. Preliminary drawings by county architects propose a group of 10 county-state-federal buildings. The county's part of the project, estimated to cost $8.2 million, will include a county court building, county office building, jail, public health building, school board building, auto tag agency and central utility plant.

Kansas City Viaduct

A traffic study to determine the feasibility of a new $35- to $50-million interstate viaduct between Kansas City, Kan., and Kansas City, Mo., is scheduled to start June 1. The two-mi span would cross the Kansas River and connect the Missouri side with the Kansas Turnpike, now under construction. The $45,000 survey is a joint project of the Kansas and Missouri Highway Departments and the Kansas Turnpike Authority.

Subway Study

Praeger-Cutting-DeLeuw, consulting engineers, has been hired to make a $200,000 preliminary study to determine operating and engineering feasibility of the proposed Cleveland subway project. The consultants' job will include reviewing previous studies, considering alternate routes and estimating the number of persons to be served by a downtown subway in 1975.

Construction Boost

The California legislature has passed two bills designed to pave the way for construction of a convention hall, opera and music house in Los Angeles. The measures would permit the Los Angeles County Board of Supervisors to (1) condemn private property for the building; (2) make an agreement with a nonprofit organization or use county funds to finance construction.

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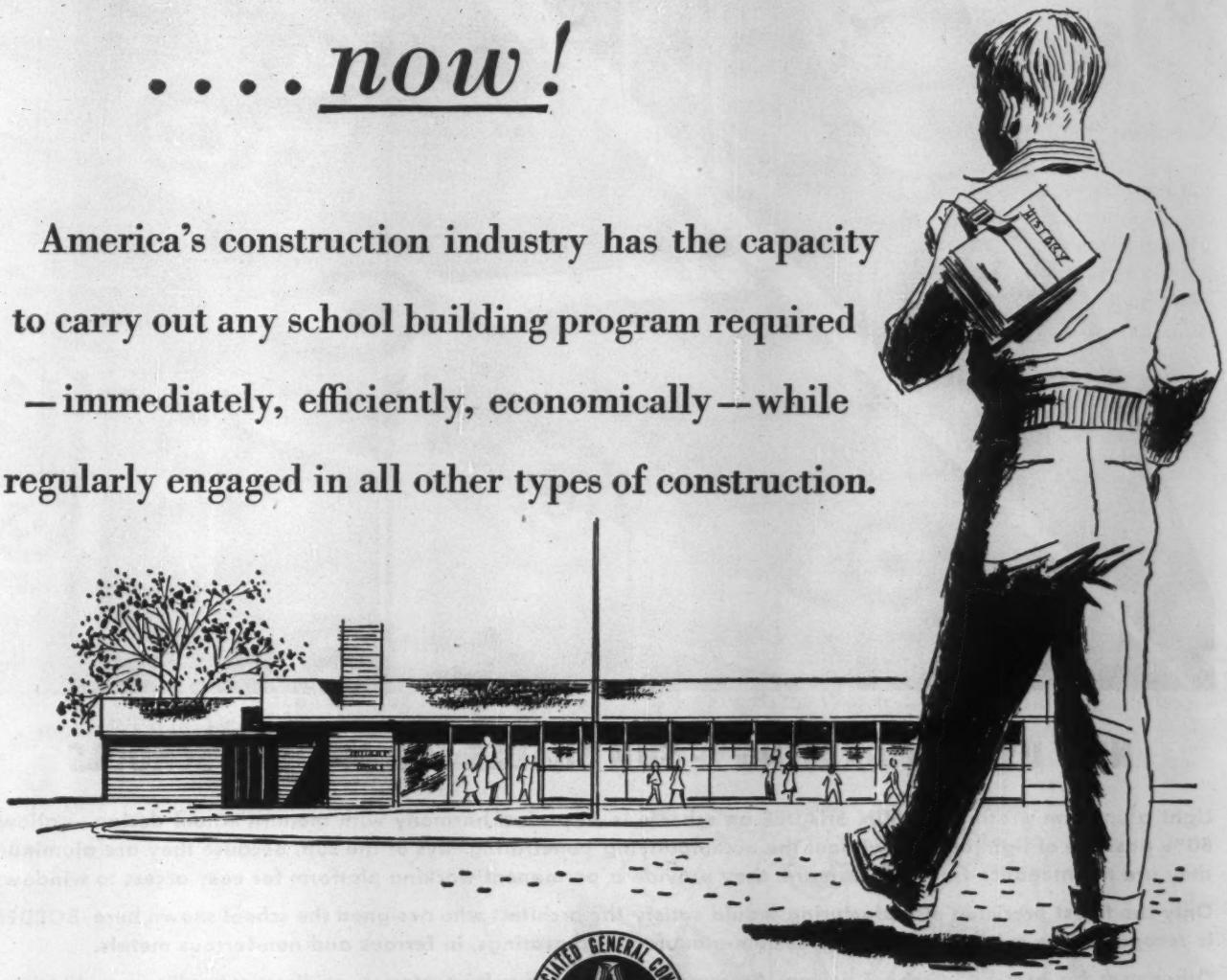

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STAFF REPORT ON

SCHOOLS

How To Get The Schools We Need

The United States, where every child is entitled to a free basic education as a matter of proud and long-established principle, is far behind in carrying out its obligation. For a nation that values education as much as we do, and has the money to pay for it, this is surprising.

There are extenuating circumstances. Until recently, the serious nature of the classroom shortage was not generally appreciated, and the obstacles that block a solution misunderstood. However, the attention directed to the school situation recently by the President has had the salutary effect of bringing the problem to the fore. Few now can fail to appreciate the need for more classrooms and for updating or replacing obsolete schools.

But getting these schools will not be easy. Estimated construction costs for the next few years would exceed present annual expenditures for schools by several billion dollars, and there are many barriers to the raising of this added money.

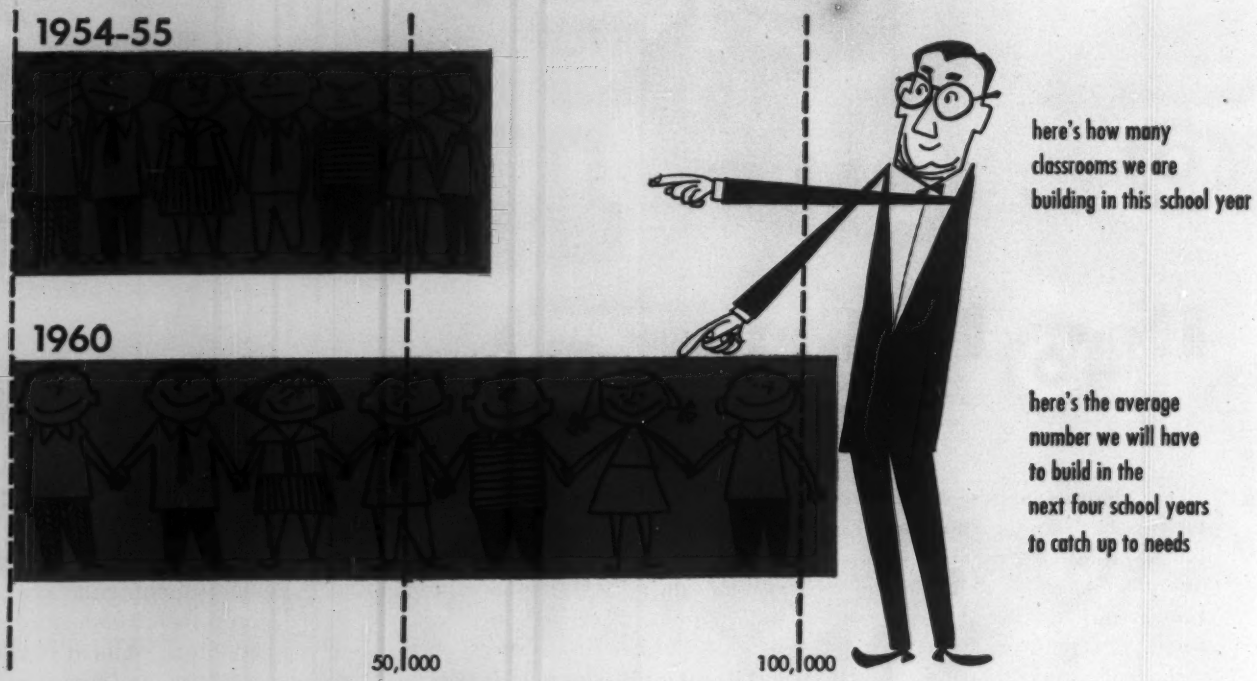
It is the purpose of the following report, prepared by ENR's staff, to show how we can get the schools we need. The report is directed primarily at three principal groups who occupy controlling positions in school building.

They are members of school boards, as representatives of the taxpayers; school superintendents, as authorities on educational needs; architect-engineers, as experts on buildings. Every other segment of the construction industry, of course, is also concerned, since the outcome depends on their combined skill and know-how.

The report suggests several measures by which state governments can make more funds available for school construction. Taken together with suggestions for getting more construction for the money spent, these possibilities indicate that federal aid may not be necessary on as large a scale as is sometimes claimed.

The report is divided into six sections:

1. Our Need for Classrooms
2. The Financing Problem
3. How to Stretch the School Building Dollar
4. The Right Way to Go About Building a School
5. Unit Costs and Their Significance
6. How to Cope With Budget Critics


1954-55
1960
50,000
100,000
here's how many classrooms we are building in this school year
here's the average number we will have to build in the next four school years to catch up to needs

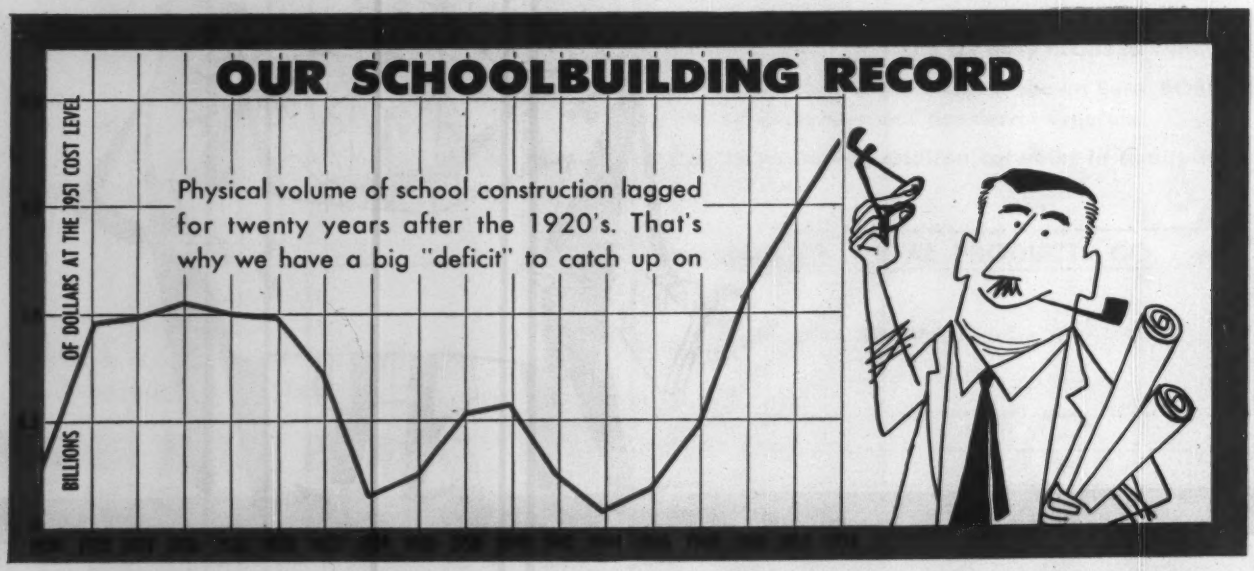
Our Need for Classrooms

By 1952, the U.S. Office of Education began publishing the results of a survey of school facilities made by state educational agencies with its cooperation. For the first time, an evaluation of our school plant became available on a country-wide basis.

This Survey of School Facilities is still not complete. But it now appears that we will need about 476,000 new classrooms by the start of the school year in September 1959 to bring our existing school plant up to date and keep pace with expanding enrollment. We are building about 60,000 classrooms in the current school year, at a cost of around $2 billion. So if we are to catch up by September 1959, we will have to build 104,000 classrooms each year for the next four years—an increase of 73% over the current level. Of this, about 50,000 classrooms are needed each year to take care of increasing enrollment.

According to recent testimony by Samuel Brownell, U.S. Commissioner of Education, we need 90,000 classrooms right now just to avoid double sessions and overcrowding. This is about one-third of the current deficit. The rest are in outmoded schools which have accumulated over the years.

According to the School Facilities Survey, nearly half of our existing schools, housing 30% of our school children, were over 30 years old in 1952. Nearly one out of five schools was built in the 19th century. About 5% of our children were still attending one-room schools in 1952. About 60% were in schools rated as only fair or else unsatisfactory by modern standards. And about 18% of our children were in schools that did not even meet fire safety requirements.


OUR SCHOOLBUILDING RECORD
BILLIONS OF DOLLARS AT THE 1951 COST LEVEL
Physical volume of school construction lagged for twenty years after the 1920's. That's why we have a big "deficit" to catch up on

About 56% of the classrooms reported on in the Survey were overcrowded by standards of the National Council on Schoolhouse Construction. About 82% of school sites surveyed did not have enough land area for adequate playgrounds and parking facilities, by National Council standards.

Most of the shortage is concentrated within a few states, the ones that have had the largest and fastest growth in recent years. Commissioner Brownell recently told the House Committee on Education and Labor that data from 34 states show that more than half the shortage is in eight states—California, Texas, Georgia, Pennsylvania, Michigan, Alabama, Florida, and Tennessee. (The 34 states do not include Illinois, Ohio, and New York.)

As might be expected, the shortages are worst in suburban areas. For our population has not only been growing rapidly; it has been shifting from rural areas to urban areas, and from central cities to suburbs.

As you can see from the table, the nature of the shortage varies widely in different states. To take the extreme cases, in Maryland 93% of the need is for increased capacity. In Kentucky, 79% of the need is for replacement.

What has caused this shortage? One of the main reasons can be found in the chart at the bottom of the opposite page. Because of events beyond our control, we have not had a normal program of school construction for a generation. During the 1920's we had a very respectable schoolbuilding program. But during the depression years, school construction declined. This situation continued during World War II and in the immediate postwar years, because of difficulty in getting materials. It was not until 1950 that physical volume of schoolbuilding once more reached the level of the 1920's.

The serious nature of our classroom situation became apparent at the end of World War II. At that time school enrollment, which had been declining since the early 1930's, began rising again. Since then, our remarkable postwar "baby boom" has pushed school enrollment up rapidly. This trend will certainly continue for at least several years to come. The 4,060,000 children born in 1954 was a record. And sometime in the 1960's another baby boom will start as the babies of the 1940's reach maturity.

The problem is aggravated by other factors. Partly because of stiffer legal requirements, and partly because times are prosperous, children stay in school longer than they used to. New educational methods call for additional facilities and equipment and changes in classroom design.

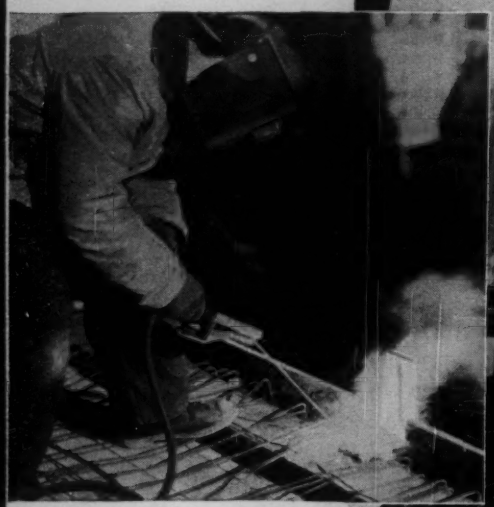
What Each State Needs

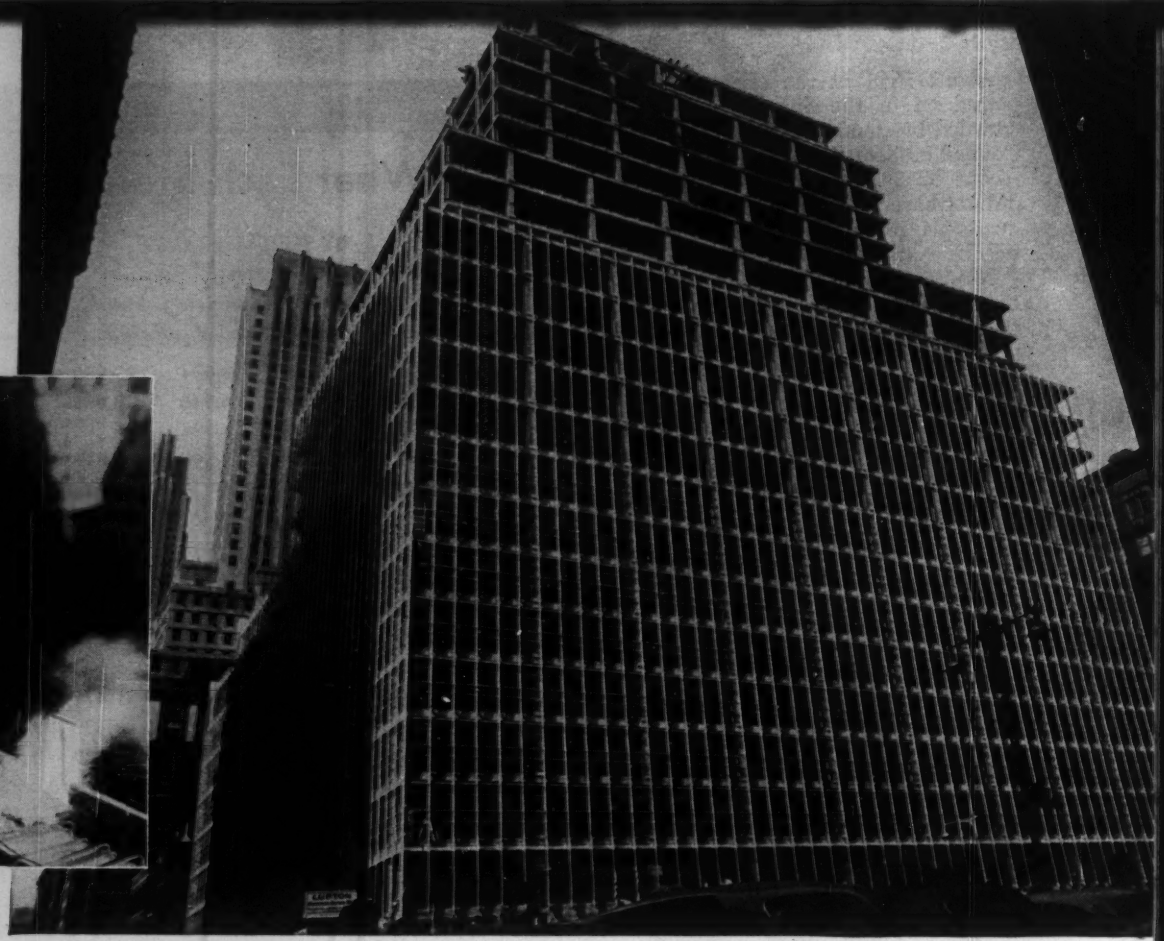
	BY SEPTEMBER 1959[1]					Percent of Classrooms needed for . . .	
State	Available[2]	To Be Abandoned[3]	New Classrooms Needed	Total Then Available	Net Increase	Replacements	Increased Capacity
Ala.	19,996	10,382	13,594	23,208	3,212	76	24
Ariz.	**5,118**	**632**	**4,346**	**8,832**	**3,714**	**15**	**85**
Ark.	14,297	4,340	8,124	18,081	3,784	53	47
Calif.	**71,647**	**16,418**	**51,594**	**106,823**	**35,176**	**32**	**68**
Colo.	10,405	1,484	4,735	13,656	3,251	31	69
Conn.	**12,059**	**795**	**5,468**	**16,732**	**4,673**	**15**	**85**
Fla.	18,540	4,084	12,304	26,760	8,220	33	67
Ga.	**20,532**	**5,190**	**26,698**	**42,040**	**21,508**	**19**	**81**
Ind.	27,973	3,979	10,600	34,594	6,621	38	62
Iowa	**19,366**	**753**	**3,568**	**22,181**	**2,815**	**21**	**79**
Kansas	21,320	4,384	9,662	26,598	5,278	45	55
Ky.	**19,310**	**8,025**	**10,237**	**21,472**	**2,162**	**79**	**21**
La.	18,362	3,194	9,665	24,833	6,471	33	67
Maine	**5,949**	**2,144**	**3,895**	**7,700**	**1,751**	**55**	**45**
Md.	13,776	492	6,750	20,034	6,258	7	93
Mass.	**28,087**	**5,685**	**10,335**	**32,737**	**4,650**	**55**	**45**
Mich.	43,445	5,424	16,672	54,693	11,248	33	67
Minn.	**21,936**	**5,674**	**9,392**	**25,654**	**3,718**	**60**	**40**
Miss.	17,503	4,385	6,290	19,408	1,905	70	30
Nev.	**1,652**	**274**	**666**	**2,044**	**392**	**41**	**59**
N. Hamp.	3,291	1,089	1,634	3,836	545	67	33
N. J.	**27,888**	**1,917**	**11,118**	**37,089**	**9,201**	**17**	**83**
N. Car.	32,181	3,100	10,519	39,600	7,419	29	71
Okla.	**19,248**	**4,186**	**7,939**	**23,001**	**3,753**	**53**	**47**
Oregon	13,170	449	3,500	16,221	3,051	13	87
Penna.	**77,892**	**9,657**	**18,670**	**86,905**	**9,013**	**52**	**48**
R. I.	3,903	433	1,295	4,765	862	33	67
Tenn.	**22,957**	**6,219**	**11,356**	**28,094**	**5,137**	**55**	**45**
Texas	65,659	17,588	28,126	76,197	10,538	63	37
Vt.	**2,720**	**851**	**1,426**	**3,295**	**575**	**60**	**40**
W. Va.	16,776	2,241	4,326	18,861	2,085	52	48
Wis.	**21,671**	**1,047**	**4,269**	**24,893**	**3,222**	**25**	**75**
Alaska	1,213	95	271	1,389	176	35	65
Hawaii	**4,000**	**429**	**1,774**	**5,345**	**1,345**	**24**	**76**
P. Rico	7,323	54	4,271	11,540	4,217	1	99
35 States	**731,165**	**137,143**	**335,089**	**929,111**	**197,946**	**41**	**59**
Mont.[4]	.....	.....	940	.....	.....	..	..
Wash.[4]	.....	.....	6,369	.....	.....	..	..
37 States	.....	.....	**342,398**	.....	.....	..	..
U. S.[5]	**1,045,000**	**196,000**	**476,000**	**1,325,000**	**280,000**	**41**	**59**

[1] **Tentative data based on preliminary returns.**
[2] This column includes classrooms under construction as of the reporting dates of the different States, which varied from 1953 to 1955.
[3] **Adjusted by net gain or loss because of contemplated remodeling and conversion.**
[4] Data not yet complete.
[5] **Projected on the basis of enrollments in all States and territories, rounded to thousands. First and second columns are projected from 35 States enrolling 70% of the pupils. Third column is projected from 37 States enrolling 72% of the pupils.**

500 PARK AVENUE, NEW YORK. Arch: Emery Roth & Sons. Contr: Uris Brothers. Lupton Curtain-Wall, Type H. Width module, 4'-5". Structural opaque colored glass from floor to sill with clear glass above. Ventilators open out. New York building code requires a masonry back-up wall to sill height.

Welding anchor clips to the building frame, at locations established by a Lupton Engineer.

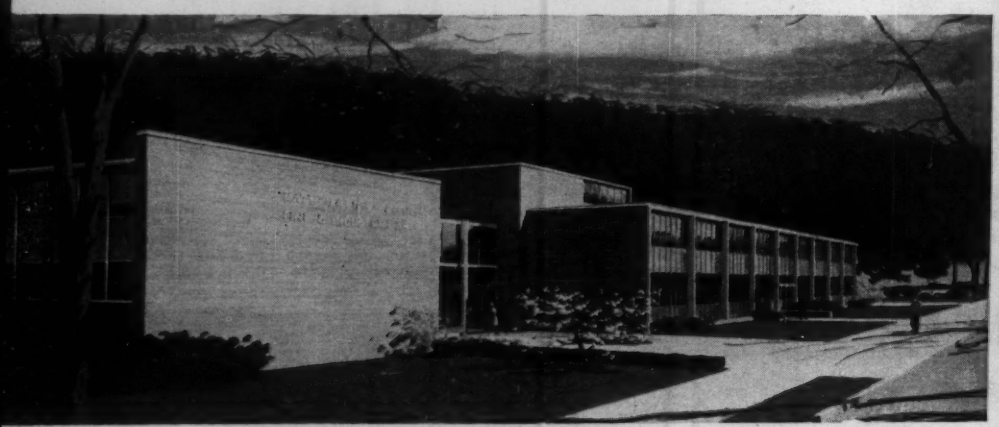




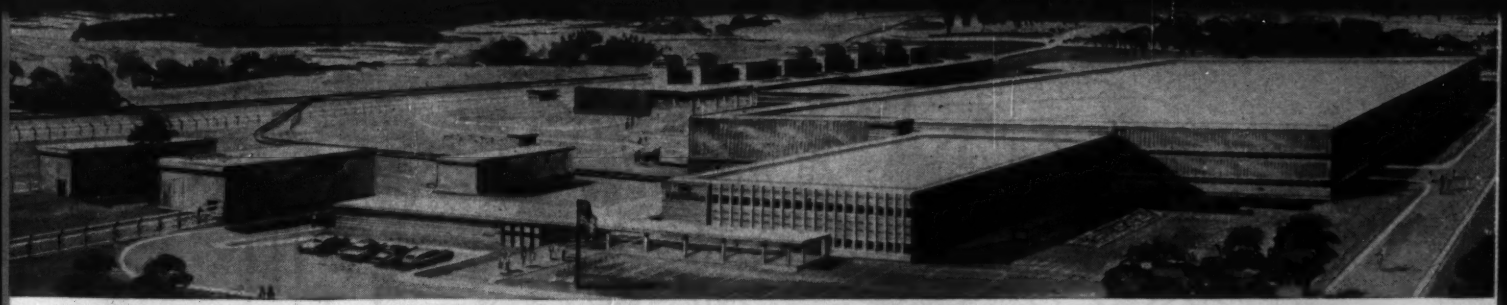
New Lupton *Simplified* Curtain-Wall System

Lupton-Engineered . . . Lupton-Made . . . Lupton-Installed

NEW JERSEY STATE TEACHERS' COLLEGE, MONTCLAIR, N. J. (2 bldgs.) Arch: Emil Schmidlin. Contr: Martin Infante Co., Inc., Lodi, N. J. Lupton Curtain-Wall System, Type H. Width modules 3'-9" & 4'-1". Fixed glass and projected-in ventilators. Opaque areas are 1/8" thick embossed, fluted aluminum, alumilited. Special features: Heavy aluminum subframes and door frames.



Exterior view of building frame showing anchor clips in position. Clips provide for horizontal and vertical alignment of the curtain-wall units.



FAIRCHILD ENGINE & AIRCRAFT COMPANY, DEER PARK, LONG ISLAND, N. Y. (3 bldgs.) The Austin Company, Designers and Builders. Lupton Curtain-Wall System, Type H in office building. Width module 5'-0". Fixed glass, no ventilators. Opaque areas are 1/8" embossed fluted aluminum sheet with 1" thick insulation and galvanized steel sheet on inside. Lupton steel industrial windows in factory.

Here's the curtain-wall *you* design — Lupton *Manufactures* — Lupton *Installs.*

This new exterior wall system offers new flexibility of design, aesthetic appeal and decided economies.

The Lupton Curtain-Wall System uses prefabricated units and aluminum mullions, designed for varying conditions and wind loads. Completely adaptable to single-story and multi-story buildings.

The Lupton Curtain-Wall System has been engineered to overcome inherent problems in curtain-wall construction — condensation — expansion and contraction — corrosion — warping and buckling.

Through standardized factory operations the Lupton System of construction offers custom-designed units at reduced costs. The design elements and construction features incorporate Lupton's more than 40 years experience in the production of metal windows. Now, you can specify type of fenestration, choice of wall unit materials, texture and color — and get what you specify. Your problems are simplified because Lupton Curtain-Walls are manufactured, shipped and installed by one responsible organization.

A COMPLETE SYSTEM

Lupton installation includes everything—anchor clips adjustable to assure accurate alignment—all aluminum framework — custom-built units with or without ventilating sections — thorough, complete inspection and checking every step of the way.

INSTALLATION ECONOMIES

All-season installation from within the building — maximum prefabrication, less to do on the site — simplified on-the-job storage at needed floor levels . . . no ground storage. All aluminum units handle easily, go into place quickly.

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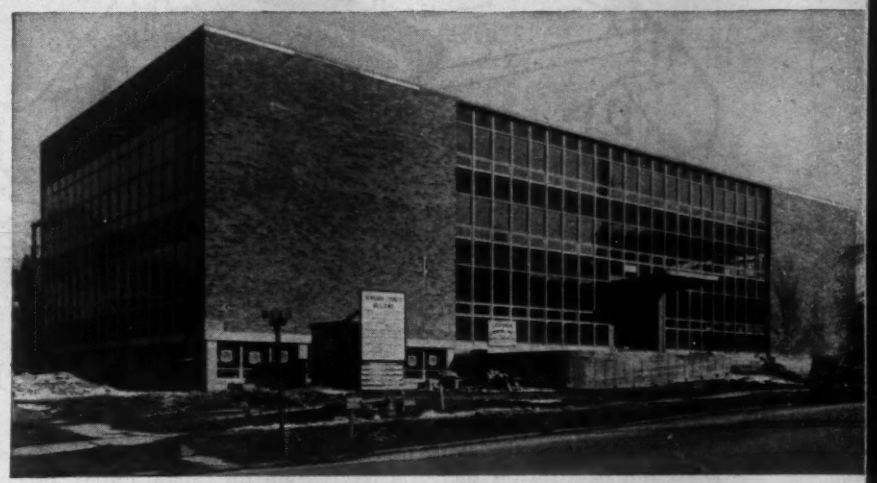
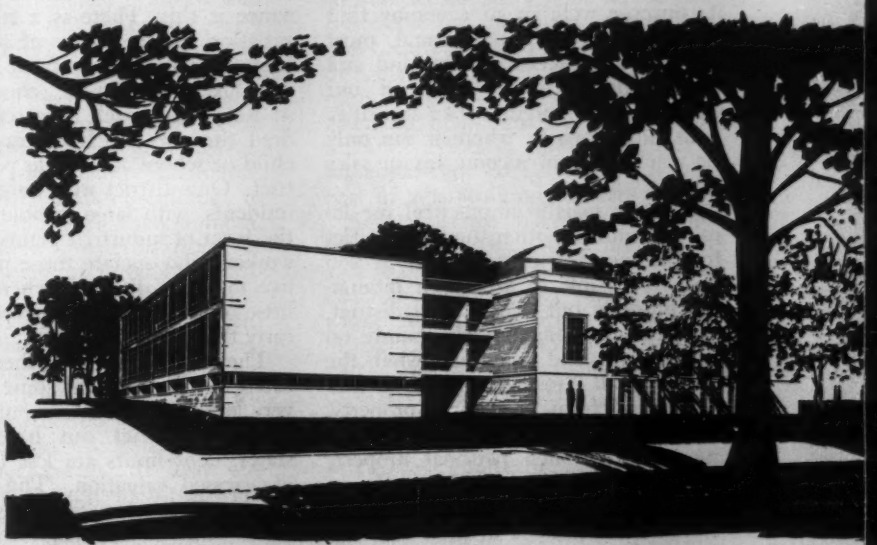


NIAGARA COUNTY BUILDING, NIAGARA FALLS, N. Y. Arch: Charles F. Obenhack. Contr: Walter S. Johnson Building Co. Lupton Curtain-Wall System, Type G. Width module, 4'-0". Double glazing, 1" thick fixed lights, 1/2" thick in ventilators. Ventilators open in. Opaque areas are double panel construction. Outside face is green-black porcelain enamel laminated with honeycomb core, galvanized back. Inside face is galvanized steel sheet covering 1" thick insulation. Back-up wall to sill height.



SCHOOL OF DESIGN, NORTH CAROLINA STATE COLLEGE, RALEIGH, N. C. Arch: F. Carter Williams. Contr: Dickerson, Inc. Lupton Curtain-Wall System, Type H. Width module, 5'-8". Fixed glass and ventilators are inside bead glazed. Ventilators open out. Spandrels and column faces are covered by aluminum sheet .102" thick, alumilited.

LUPTON

Metal Windows and Curtain-Walls

The Financial Problem

Schools are traditionally administered and paid for on the local level. From this fact comes much of the financial problem. For the only important tax that usually is practical at this level is the property tax. A century ago, the property tax served its purpose well; in an economy that was predominantly agricultural, most wealth was concentrated in land and farm buildings. Now most of our wealth is in intangibles like securities and bank deposits, where it can only be reached by an income tax or sales tax.

But it's usually impractical for local governments other than large cities to tax incomes or sales. It is too easy for people to take their intangible property out of the local district. So local governments rely mainly on taxing land and buildings—what the lawyers call "real" property as distinguished from "personal" property. Most of them don't even try any more to tax such personal property as livestock and household goods.

The result of this long-term trend is that local school districts are having an increasingly hard time paying for operating costs and for construction.

Most states long ago began to help out on operating costs. But the burden of financing construction has been left with local districts until very recently. Even today nearly half the states still give no help to their districts on construction; and only about 15 provide any substantial aid. The federal government provides no aid for capital outlay, except in areas where the school problem has been complicated by federal activities.

• **Wide variation**—The first thing that strikes anyone who studies school finance is this: There is a tremendous variation in the ability of school districts to raise money from the property tax. The richest school district in a state may well have several hundred times as much tax capacity per child of school age as the poorest district. One district may have very few residents, with large taxable values in the form of industrial plants. Yet the workers who operate those plants may live in other districts, where there is little or no industrial property to help carry the tax burden.

The situation is further complicated by the fact that some states set very low limits to the amount of debt a school district can have. In 19 states, debt limits are less than 10% of assessed valuation. The lowest is 2%, in Kentucky. Several states also set a limit to the tax rate which a school district can levy.

• **Consolidating districts**—A good deal can be done to equalize variations between districts by consolidation. Since 1944, the number of school districts in the U. S. has been reduced from 112,000 to 63,000. But there is still a long way to go.

Of the existing districts, 11,000 have no schools of their own. Another 31,000 actually have less than 50 pupils. About 12,000 districts have from 50 to 300 pupils. Only 9,000 districts have 300 or more pupils—and even 300 would be quite small for an efficient 12-grade school system.

This is one reason why most small districts that operate elementary schools send their high school children to other districts. Many state laws limit the tuition that must be paid for these children to the operating cost per pupil. Hence the small district that has no school at all escapes the tax burden for capital outlay, and the small district with no high school escapes part of the burden.

At House hearings this spring, U. S. Commissioner of Education Samuel Brownell cited the case of a midwestern state where 70% of the total area of the state lies outside districts that support high schools, and thus is not taxed for high-school construction. Of the 836 high schools in this state, 486 have less than 50 pupils. Why is this? Brownell quotes a state education official: "Many of these districts fear to lose their individual identity and prefer to overwork their own property tax base. They have been asking the State legislature for more aid rather than accepting a situation more beneficial to their school children."

• **Measuring financial effort**—Consolidation of districts and state aid to

districts can do much to equalize variations in tax capacity. But a difficult problem arises in distributing state aid: How do you compare the effort that districts are making?

In District A, for instance, actual market value of taxable property is $20 million, and this is assessed at 80% of market value. That gives an assessed valuation of $16 million, and (assuming the debt limit is 10%) a borrowing capacity of $1.6 million.

But in District B, a richer area with approximately the same school needs, market value of property is $25 million. This is assessed at 30% of market value, giving an assessed value of $7.5 million. District B's debt limit is $750,000.

So District B, the wealthier area, will reach its debt limit much sooner than A. And of course its tax rate, in terms of mills per dollar of assessed valuation, will be much bigger than in A. This makes it seem as if B needed state aid worse than A. And this is one reason why many local districts assess property at a low ratio of actual value.

• **Adjusting taxable value**—Unless the state works out some method of adjusting assessed value to market value, its school aid program is likely to favor B. Even a ratio of assessed value to market value is apt to be fuzzy. Different appraisers have varying ideas of value. Comparable pieces of property within the same tax district may be assessed differently. Different classes of property may be favored over others: new homes may be assessed closer to market value than old ones, commercial property valued closer to actual value than residential property.

The problem is not simple. But it is possible for states, by making spot appraisals, to work out a rough approximation of the fiscal effort being made by school districts. New York and several other states have developed methods of determining actual property values. Others have developed indexes of taxpaying capacity, based on such factors as value of retail sales, manufactures and other products, income-tax returns, payrolls, car registrations, and so on.

• **New York's experience**—The school problem of course varies widely in different states. But New York's experience in handling capital outlays is worth close study.

In 1949, a committee that had been appointed by the State Comptroller to study tax and debt limits, and school finances, started analyzing financial capacity in school districts. As a result, the committee proposed several changes in the state constitution and laws which were OK'd by the legislature and the voters. Among other things, it was provided that debt limits would be based on full valuation, not assessed value. That increased the borrowing capacity of all school districts, in some cases very sharply.

At the committee's recommendation, a State Commission on School Buildings was set up. It analyzed various estimates of school needs in New

York City and the rest of the state. In the words of its 1954 report:

> "When these estimates were traced back to original sources it was found that they frequently combined intuition and optimum future desires with basic and immediate needs. Few localities had made the thorough area studies, inventories of existing facilities, evaluation of existing buildings according to definite standards, and cost studies required to choose among abandonment, conversion, modernization, or replacement of buildings. Estimates of cost were at best guesses not based on careful consideration of potential economies and various ways of avoiding or reducing the need for new construction where satisfactory facilities would be provided by other means. It also was found that some localities were not conserving their resources through well-developed programs for financing capital outlays."

The Commission found that only a very few districts could not meet their immediate school needs. It proposed—and the legislature carried out—a revision of obsolete school building standards, set minimum standards for school sites, and other things. In its report, the Commission notes that in 1953 elementary school building contracts for districts outside of larger cities were nearly $200 per pupil lower than in 1952 and 1951, in spite of higher material and labor costs. At the same time, minimum size of classrooms was boosted from 660 sq ft to 770.

The Commission has also worked to reduce the tax advantage to districts that send part or all of their pupils to other districts. Since 1951, more than 700 small school districts have been eliminated. The state now has about 2,300 districts. It had 9,900 back in 1925.

The Commission also reports that it and other state agencies were able to:

1. Develop and improve procedures for making more accurate future enrollment estimates in school districts.
2. Find better ways to take care of temporary enrollment increases in particular grade levels in specific school districts, without expanding the school plant needed over the long run.

As a result, New York State has not had to borrow any money at all for school construction. And from 1951 through 1954, less than $1 million was loaned to school districts for construction.

• **Forms of state aid**—However, other states have found it necessary to give substantial aid for school capital outlays. Aid has been for special purposes, such as consolidation of school districts and abandonment of one-room schools. State grants may be given to help equalize variations in financial capacity. Sometimes this is on a one-shot basis, sometimes it is part of a continuing program.

Several states have "foundation" programs, by which they make available a certain prescribed amount per classroom unit or per pupil for the whole education program. The local district may be required to provide part of this, depending on its financial capacity. Part of this foundation grant may be reserved for capital outlay and debt retirement.

The best known example of a foundation program giving capital aid is Florida's. In this setup, the state and the local district together guarantee $400 a year per classroom unit for capital outlay and debt service. State funds are provided out of auto registration fees. The proportion provided by the State ranges from about 94% in the poorest district (most Florida school districts are county-wide) to about 61% in the richest. Any money not actually paid out for construction or debt retirement goes into a separate fund, to be drawn on later. If

. . . State aid plans have many variations

the local district needs more money for capital outlay than is available from this source and from local taxes, it can sell bonds and use its annual foundation grant to help retire them. The fact that the state is giving a fixed annual amount improves the credit rating of the local bonds.

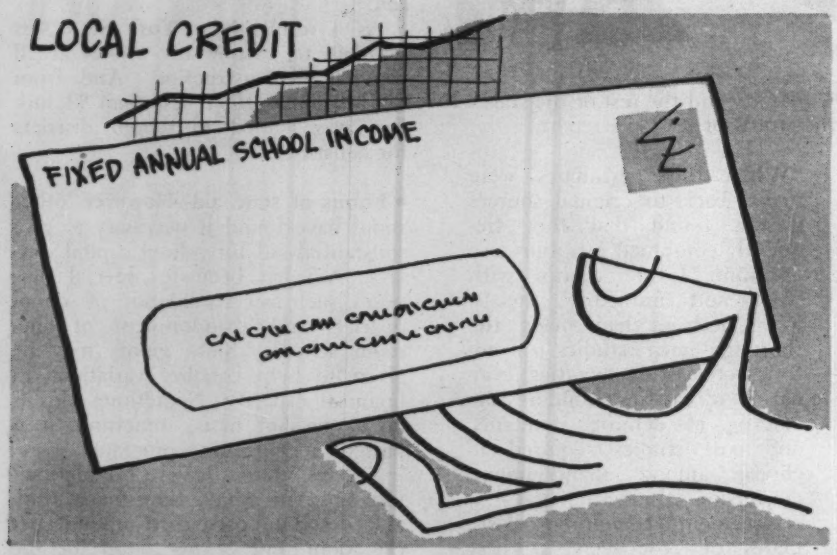
The assumption in the "Florida Plan" is that the minimum cost of an average classroom is $16,000. The $400 a year per classroom is intended to permit replacement or modernization of all classrooms over a period of 40 years.

• **Project-by-project aid**—This plan is suitable where districts are already quite large. But in a state like Washington, which has about 2,000 districts and needs further consolidation, a foundation plan would tend to freeze the existing districts. Washington allocates construction money on a project-by-project basis to districts with the most urgent needs. The ratio of state aid varies from 90% on down, depending on the district's property valuation as adjusted by the state tax commission.

California has another approach. It makes building loans to districts that have gone over 95% of their debt limit. The state will lend enough money to build needed classrooms. In return, the district must levy a tax of 30¢ per $100 of assessed value—but whether or not all of this money is turned over to the state depends on what the district's payments are on other debt. Interest on the loan is paid for 25 years. If not paid off in 30 years, what's left becomes a grant.

• **Building authorities**—Several states follow the Pennsylvania pattern of a state building authority—and sometimes local authorities, too—which finance the school for the district. The authority arranges financing by selling revenue bonds, secured by the rentals to be paid by school districts. Depending on district need, the state may pay part of the rental.

This method has been criticized because borrowing costs for revenue bonds generally run from ½% to 1% higher than rates on general-obligation bonds issued directly by the state or school district. Instead of evading the debt limit, it is asked, why not raise the debt limit? Also, it is argued that state aid in the form of payment of part of the rental costs the state more than if it borrowed the money directly and paid it to the district. State aid sometimes makes up a very high proportion of the rental.



• **Private builders**—Occasionally, large-scale home builders have themselves built schools and rented them to school districts on a lease-purchase basis. For instance, Levitt & Sons built schools at Levittown, Pa., because the local district lacked borrowing capacity. The firm was able to build the schools cheaply, because it followed its own design and because it already had men and equipment on the site.

Several plans are under way based on the idea that private builders could cut costs considerably if they built standardized schools on a mass basis. A plan being offered by the Boston architect-engineer firm of Anderson & Nichols would provide a package—financing, design, and construction of standardized schools. The California legislature is considering a plan by which schools would be built under lease-purchase agreements with private groups. And National Homes Corp., the leading prefab manufacturer, is getting ready to sell prefab permanent schools.

This sort of approach is still in its early stages. But it could do a great deal to solve the school problem.

Federal Aid For Schools

Bills to establish a large-scale program of federal aid for school construction are now being considered by Congress. Before going into the nature of existing proposals, let's take a look at the background.

Federal aid for school construction goes a long way back to the time when public lands and funds derived from sale of public lands were given to the states formed after the Union was established, to aid education. During the depression of the 1930's, the federal government gave grants for school construction or built them directly.

In World War II, the Lanham Act provided about $81 million for school building in areas affected by defense activities. This lapsed in 1946. Starting in 1950, Public Law 815 began providing federal aid for school construction in areas affected by federal activities. Under this and succeeding legislation, about $515 million will have been paid out for school buildings up through June 30.

• **The case for federal aid**—During the past few years, quite a number of bills have been introduced in Congress to give general aid to school building. Supporters of federal aid argue that education is partly a federal responsibility, and that it would help equalize the wide differences in educational opportunity among and within the states. They point out that many children educated in poor states grow up to migrate into the wealthier states. They argue that many of the poorer states are a "colonial hinterland for the great industrial and commercial centers of other states". Part of the wealth produced by western and southern states goes elsewhere, and it is hard for these state governments to tax it. Finally, supporters of federal aid point to the obvious need for better schools.

• **The case against federal aid**—Opponents of federal aid, on the other

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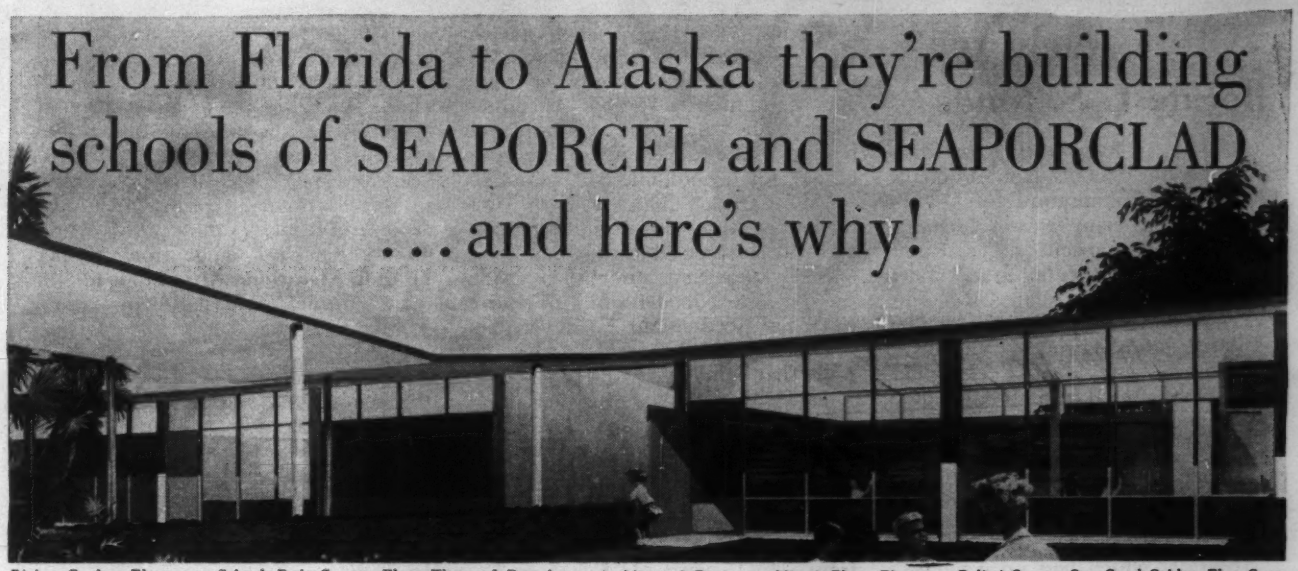

Riviera Gardens Elementary School, Dade County, Fla. • Watson & Deutchman, Architects & Engineers, Miami, Fla. • Thompson-Polizzi Constr. Co., Coral Gables, Fla., Contr.

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Ketchikan High School
Ketchikan, Alaska
King Street Elementary School
Port Chester, N. Y.
Industrial Canal High School
New Orleans, La.

Junior High School
Davenport, Iowa
Temple Univ. Medical School
Philadelphia, Pa.
Phoenix Memorial Bldg.—Univ. of Michigan
Ann Arbor, Mich.
Notre Dame High School
Chicago, Ill.
Southwest Junior High School
Johnson County, Kansas
Senior High School
West Springfield, Mass.
Patterson J. H. School
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. . . How would you allocate U. S. funds?

hand, start out by observing that capital outlay for schools is traditionally a state and local responsibility. They argue that in many areas the taxing and borrowing capacity of local governments are not fully used. They point out that the states are only just starting to do something about tax equalization, raising of unrealistic debt limits, and district consolidation. The Council of State Chambers of Commerce notes:

> "Many states are not utilizing tax sources which are productive of substantial revenue to others. For example, in 1953 there were 16 states which had no general sales tax or gross receipts tax. Among the other revenue sources which a number of states do not utilize are income, gift, and cigarette taxes."

Another big argument is that federal aid might tend to perpetuate local inequities that the states will have to correct if left on their own—as New York, for instance, has done.

• **Headaches**—One of the worst problems in connection with a federal-aid bill is the same that crops up in connection with state aid: How do you allocate the funds between states? Should you measure the financial effort that individual states are making, so as not to penalize the states that have done much to solve their problem in favor of the backward states? Would you require states to eliminate unnecessary districts, equalize ratios of assessed value to market value, and raise debt limits to some overall minimum before becoming eligible for federal aid? Would you require a state to have its own program of aid for schoolbuilding before becoming eligible? This, of course, immediately raises the question of federal control over education.

Such provisions might be sidetracked in a federal-aid bill, of course. Financial need might be determined solely by general formulas. Here are some that could be used:

1. Total individual income of all citizens in a state, per school-age child. This not only allows for variations in economic wealth among states, but it also allows for the wide variation in the ratio of school-age children to adults. In 1950, the ratio of the population from 5 to 17 years old to the population 25 years to 64 years old varied among the states all the way from 30.5% to 64.2%. The ratio is particularly high in the southern states. South Carolina has the highest of all, more than double New York's ratio of 30.5%.

2. Ratio of operating expenditures for public schools to total income payments within the state. (This of course ignores variations between states in amount of money raised privately for private schools, who educate about 12% of our elementary-school and high-school children.) In the school year 1950-51, the ratio ranged all the way from 1.75% for Rhode Island to 3.70% for New Mexico, with an average of 2.27%. All southern states except Kentucky and Virginia were spending above the national average for public school operation. Several were spending far above average. By comparison, New York was below average (2.00%).

3. Capital outlay per school-age child. This has to be an average of several years, because capital outlays of course vary widely from year to year, and have no relation to income in any particular year. An annual average of capital outlay for the period 1948-51 shows a range from $9 per pupil in Maine and Mississippi to $98 in California, a fast-growing state. The U. S. average was $38.

• **Pending bills**—Bills introduced into this session of Congress involved various formulas for allotting federal money to the states, involving number of school children, per capita income, and average spending for public schools. A simpler formula would be a flat grant per pupil. This would have an equalizing effect, since generally speaking the states which have the lowest financial capacity would get back from two to four times as much in federal aid as their citizens would have to pay in taxes to provide that aid.

The Administration has introduced a more complex bill which would have the federal government (1) buy $750 million over three years of the bonds of districts which are unable to sell them at reasonable rates in the bond market, (2) provide $150 million to match with the states in setting up a reserve fund to back the credit standing of school building authorities, (3) provide $200 million to match with the states in making grants to districts unable to finance schools in any other way. Strong opposition has developed to the schoolbuilding authority idea.

A four-day White House Conference on Education is scheduled for this November. Before that time, Washington education officials hope that grass-roots conferences will be held in every school district and in every state in the U. S. School district meetings are being sponsored by the National Citizens Commission for the Public Schools and the American Association of School Boards.

By the end of this year, thinking about school financing may have clarified considerably. Up to now, this much seems apparent: A good deal could be done to increase the financial capacity of school districts. Even when this is done, many districts will not be able to carry the full burden of capital outlay. Many states could do more for school construction than they have so far. But in some cases their financial capacity may not be equal to the job. Eventually, if we are to get the schools we need, the federal government may have to step into the picture.

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Cleveland Board of Education
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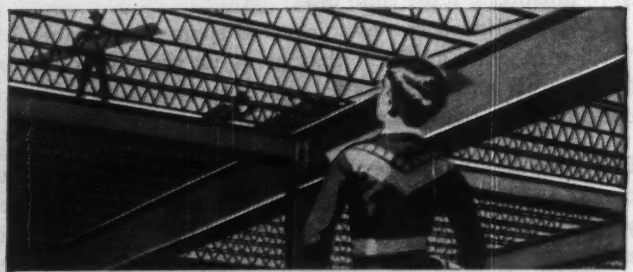

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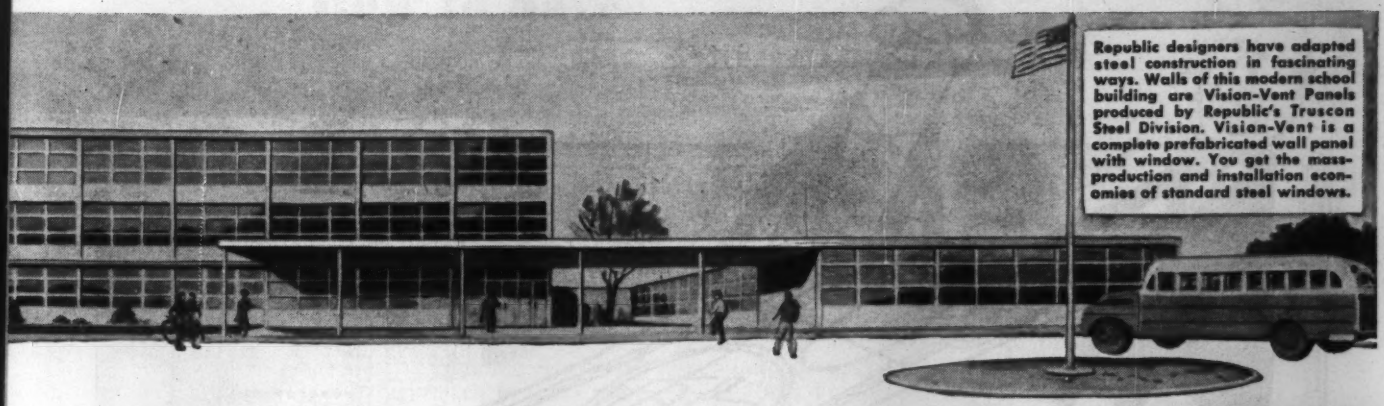

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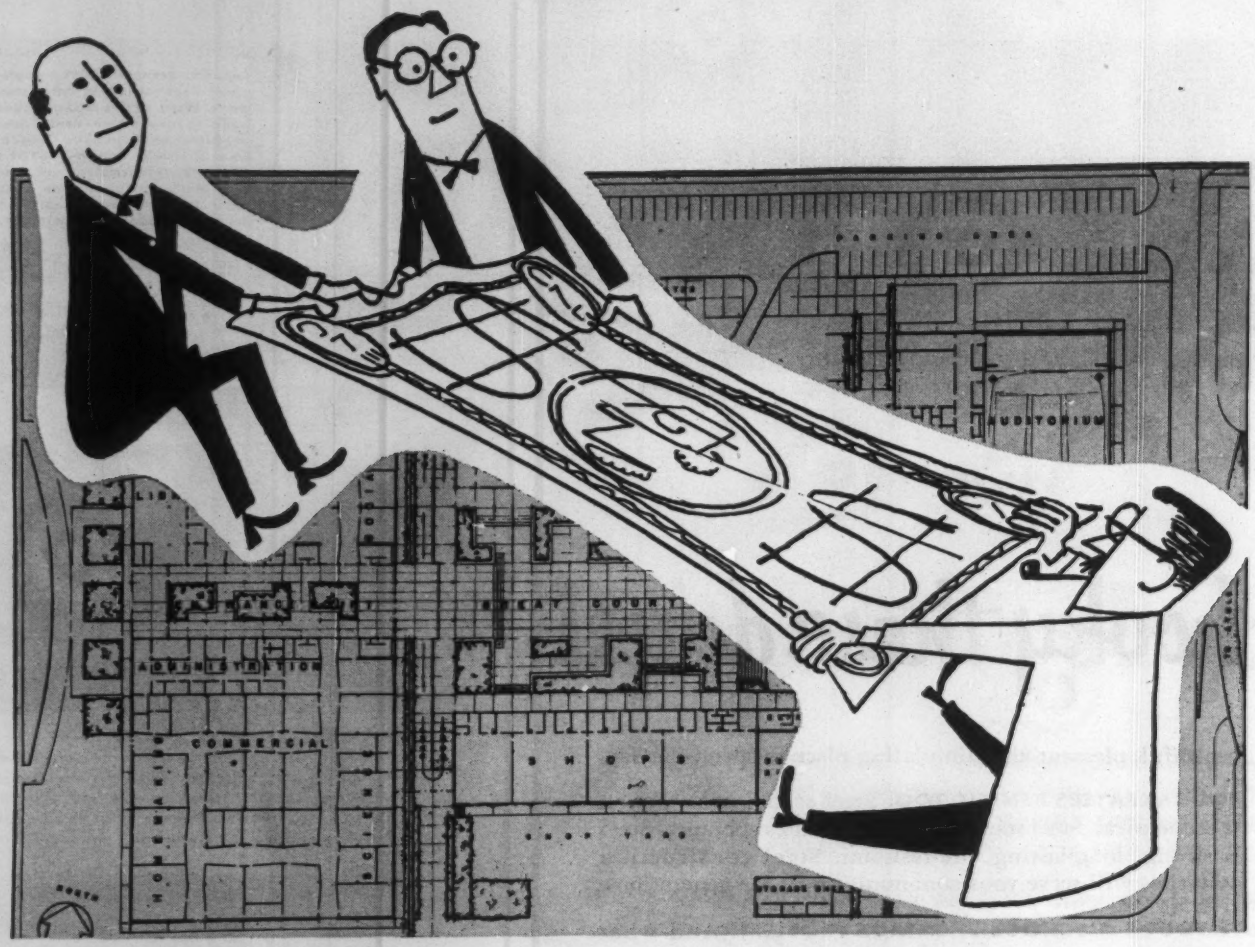


How to Stretch The School Building Dollar

Next to raising funds for school construction, the biggest problem is how to get more for the money that must be spent.

A further solution is especially difficult because school boards, educators and architects-engineers have already done much to keep costs down—it will require the utmost in ingenuity to better their achievements to date. Yet, an ENR study of many of the nation's newest school buildings shows that steady progress is still being made.

To get the latest thoughts on how savings in design and construction might be achieved, the ENR staff interviewed several hundred architects, engineers and educators, visited more than 100 schools under construction and examined the plans for many more.

There is little evidence of a radical solution that would take a big bite out of construction costs in one fell swoop. Rather, the conclusion is that further reductions will have to be achieved through many little savings on all items that comprise the school plant.

The study turned up many suggestions for whittling down costs without impairing quality of education or construction—suggestions that had been actually tried out, with success.

Some of the cost-cutting ideas that show the greatest promise are presented in the following pages. In selecting them, consideration was given to long-run costs as well as to initial costs. For there would be no advantage in substituting a cheap material for a more expensive one that would cost less when installed or would require less maintenance and repair. Also, consideration was given to costs of materials and equipment in place, rather than just to costs fob factory.

• **Will it work in your area?**—It should be noted, however, that success of a method in one school district does not necessarily mean that it will be economical elsewhere. Each suggestion must be considered in the light of local conditions. It might not work at all, or it might have to be modified.

Says Richard J. Adams, of Sherlock, Smith & Adams, architects-engineers, Montgomery, Ala.:

"To date, I do not feel that there is any particular type of construction that is a cure-all, but rather that the architect must carefully analyze the community in which the school is to be built. He must study local building materials, labor conditions and the experience in regard to construction methods of the contractors most likely to bid on this particular job. Our experiences indicate that 100 miles in any direction may dictate a thoroughly different type of structural system and wall material."

How to Save In the Planning Stage

The study indicates that basically the economy of a school design rests on shrewd planning of facilities. This conclusion is well brought out in a letter from Philip Will, Jr., of Perkins & Will, architects-engineers, Chicago, Ill.:

"It is our experience that the major cost saver in school buildings is careful planning.

"Careful planning is a broad term but is here taken to mean the careful allocation, arrangement and full utilization of space. It means the dual use of many spaces: . . . use of enlarged lobby spaces for cafeteria or library reading room; use of portions of a corridor in connection with the multipurpose room. In some elementary schools, the corridor has been eliminated entirely and made a part of the classroom teaching area.

"Such planning economies have much more to do with dollar saving than any choices you can possibly make in construction methods.

"Also included under the general heading of good planning would be the careful integration of all parts of the building. By this I mean the careful selection of mechanical systems, lighting, structure and architecture so that each contributes the maximum to the esthetic and functional purposes of the building and so that each enhances the other without friction or interference.

"Possibly a third factor in planning could be added. This would be the development of a consistent attitude in the choice of structure, materials and equipment. One does not mix beer with champagne. Therefore, everything that is selected should be of the same general quality level. We need to remember the lesson of the one-horse shay."

Cut Down on Floor Area

Other things being equal, the smaller the floor area the less a school will cost. But generally, you can't reduce the present size of classrooms, which run about 30 sq ft per pupil or more—in fact, the trend now is toward larger rooms.

"I don't feel it would be advisable to reduce classroom space unless you reduce the number of pupils per class," says Ward I. Miller, superintendent of Wilmington, Del., public schools. Alfred Christensen, planning consultant of Falk & Booth, San Francisco architects-engineers, adds: "In activity-type teaching, you need 30 sq ft per pupil. If you have less than this, your equipment will take so much of the space you'll find you have gone back to question-and-answer teaching. That is not economy."

• **Use the outdoors**—In some parts of the country, where climate is favorable, there is a possibility of some reduction in classroom space by using outdoor areas for some activities.

Says Forrest M. Kelley, Jr., school architect, Florida State Department of Education: "Where there is a close relationship between interior and exterior of classroom space, some portion of the activity program may take place out of doors. But the furnishings and equipment must be sheltered, and those activities that normally take place in close relationship to those furnishings and arrangements still require a basic minimum allotment of space.

"Florida schools have gone in the direction of reduced classroom sizes as far as it is advisable to go. Movable cabinets increase the flexibility of usage of floor space in classrooms, permitting this maximum reduction to be obtained."

The space required per pupil in classrooms is closely tied to teaching methods. Unless these change, a trend toward smaller rooms is unlikely.

So the search for means of reducing floor area must move in other directions. How about eliminating areas that are seldom used?

• **Consider multipurpose rooms**—One way is to double or triple up on the use of spaces required only during part of the school day. Combination rooms can be employed if there will be no conflict in scheduling their use for the different functions, if adequate time will be available for each of the functions to be served, and if the physical facilities required for each of the functions are somewhat similar in dimensions and nature.

A good example of multipurpose space is found in the Norman (Okla.) Senior High School, designed by Perkins & Will in association with Caudill, Rowlett, Scott & Associates, Bryan, Texas. They used a two-part space at about the geographical center of the building as a "student center." One part has a large, open and comfortably furnished space that serves as (1) a student lounge, (2) overflow reading space for the library, (3) waiting space for the school office, (4) lobby for the auditorium and (5) lobby for

the gymnasium. The second section is a coat and locker space.

Instead of the steel lockers being spread throughout the corridor of the building, they have been concentrated in a central location. Instead of full-length lockers, coats are hung in the open on captive hangers, and a small space above is provided for the locking of books and personal valuables.

"This," says Will, "has proven economical in terms of space, construction cost and maintenance. Along with the adjacent social center, it has given this school a heart which has added much to the spirit of the student body as well as the academic functioning of the school."

In planning the Dexter (Mo.) Elementary School, William B. Ittner, St. Louis architect, combined auditorium, gymnasium and cafeteria, reducing the cost of these facilities about two-thirds. He cautions, however, that no room could be designed for three purposes and still be as satisfactory for each purpose as one designed for a single function.

The New York State Commission on School Buildings suggests, in addition, the following combinations: gymnasium with auditorium or cafeteria; auditorium with music room, band room or cafeteria; library-study hall; music room-stage; audio-visual room with little theater and music room; board room with conference room and principal's office; cafeteria with study hall, stage or playroom; combined shops; teachers' rest room-health room; classrooms with home-making room, science laboratory, physics laboratory, or chemistry laboratory (Economy Handbook, The University of the State of New York, Albany).

In one-story elementary schools, dining rooms may be eliminated, pupils being served in their classrooms. If this is done, kitchens should be designed to service and store portable serving carts.

Sometimes, floor area can be decreased by sizing the cafeteria to accommodate the pupils in several shifts, instead of the whole student body at one time. Similarly, auditorium costs may be cut by sizing the room for only part of the enrollment—some designers suggest one-half.

• **Drop out corridors**—Another way to reduce floor area without impairing the educational function is to minimize or eliminate corridors or put them to educational use.

For one thing, corridor widths should be kept to the minimum size consistent with safety and student traffic requirements. The building also should be laid out to reduce length of corridors. Furthermore, passageways of minor value or that will be used infrequently should be avoided. Vestibules should be placed inside the corridor rather than added to the exterior of the building.

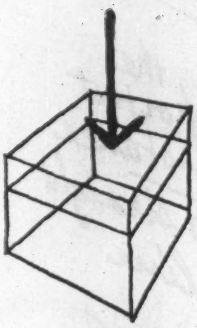
To decrease floor area in the Bristol Elementary School in the Webster Groves suburb of St. Louis, George Hellmuth & Associates eliminated nearly all corridors by expanding the corridor between four classrooms into a multi-purpose room.

Where topography permits, this firm also has used split-level corridors to save space. Another technique is to widen the corridor to serve as a student lounge.

Where climate permits, outdoor walkways may be used instead of indoor corridors. The architects for two elementary schools in Blackwell, Okla., estimated that without additional cost, four extra classrooms could be added to the original 14 planned if outdoor corridors were used instead of more expensive heated indoor corridors. The four classrooms were included. Now in operation five years, this school has proved very economical.

Though a strong trend toward outdoor corridors developed in the warmer regions of the country, it now can be observed even in northern sections. Usually, these walkways are covered for protection in wet weather. The cost of extending the roof to provide the cover should be compared with that of a separate lightweight construction.

Decrease the Height



Important additional savings can be made by lowering the ceiling height of rooms to the minimum permitted in the state.

This may have a beneficial effect from the educational standpoint because it brings rooms more into scale with the size of pupils ("Lower Classroom Ceilings," by W. W. Theisen, School Plant Studies, BT 1-16, American Institute of Architects). And the decreased height enables construction costs to be cut by permitting lower walls and partitions and reduced piping runs; furthermore, it cuts the heating bill.

However, ceilings cannot be lowered arbitrarily. Their height is intimately related to room lighting and to some extent to ventilation. If contemporary good design practices are followed, however, ceiling heights are relatively unimportant as far as air flow is concerned ("Toward Better School Design," by W. W. Caudill, F. W. Dodge Corp., New York, N. Y.). But the effect of lower ceilings on daylighting is considerable.

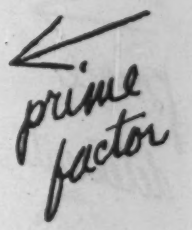
If, for example, the only source of light is a group of windows along one side of a room, lowering the ceiling not only decreases light in the areas close to the windows but also the illumination at the far wall. However, if windows are placed in two opposite walls (bilateral lighting), the lower ceiling is nowhere near as objectionable . Furthermore, if top lighting (skylights) is used the effect of lowering the ceiling is reduced even more.

• **The trend is down**—Experience with lowered ceilings has been favorable throughout the country.

Says Wm. Henley Deitrick, of Deitrick-Knight & Associates, architects, Raleigh, N. C.: "Full fenestration and use of sky domes have brought ceiling height down from 12 ft to 10 ft in this area." To which Norman J. Aaron, assistant superintendent of Fulton County (Ga.) schools adds: "Our classrooms are not over 10½ ft high, cafeterias not over 12 ft, auditoriums (not including gymnasiums) or multipurpose rooms not over 18 ft. By reducing heights of the structures, the cubage is proportionately reduced, and as a result the overall cost of construction is reduced. Also, economies will be realized in fuel savings during the heating season."

Hugh W. Hiatt, architect, Bureau of Architecture, San Francisco, reports: "We keep ceilings as low as possible, and they are tending downward. The average ceiling today is 9½ to 10 ft, as compared to 12 ft previously used." The New York State Commission on School Buildings recommends 9 ft as a minimum.

• **How many stories?**—Another matter affecting economy during the planning stage is the question of whether the building should be one story high or more. The answer, of course, depends primarily on the site. When the site is suitable for either type, however, it may not be easy to determine which is less costly.



For example, Walter McKee, associate superintendent of schools, Montgomery, Ala., says he prefers two-story buildings for economy reasons and the appearance of flat-roof types. And Hugh Hiatt, speaking of San Francisco schools, points out, "Most of our schools are two to three-story buildings, although a few are one-story. This isn't necessarily a matter of choice; most of our sites are restricted and hilly and therefore land themselves to multistory building."

But Alfred Christensen, of Falk & Booth, argues that the one-story building is good because it allows a direct relation between inside and outside activities. Mark Falk, a structural engineer for the same firm, adds: "You don't need such high-quality fire resistance, and it lends itself more readily to expansion."

The New York State Commission on School Buildings recommends: If it is difficult or costly to obtain an adequate site, as in large cities, it may be advisable to construct a multistory type of building. Where this is not the case, one-story buildings offer the following advantages, which tend to reduce construction costs.

"1. Costly stairways and the space they occupy are eliminated.

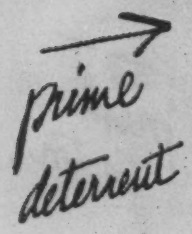
2. Lighter and less costly construction is possible; less fire-resistive construction is permitted, since children can get out of a one-story building readily.

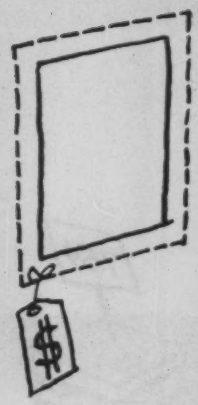
3. There is more flexibility in laying out the building and in meeting area requirements without waste of space.

4. In general, fewer toilet and other sanitary facilities are required."

• **The trend to the finger plan**—One form of the one-story school building, used extensively in California, has been spreading to the East. Known as the "finger" plan, the layout places classrooms and laboratories in several rows branching from a main corridor and spaced far enough apart not to block off light and breeze from each other. Each row of classrooms borders a corridor. Generally, the rooms are bilaterally lighted and ventilated.

The finger plan offers flexibility, easy expansion, good lighting and good ventilation in addition to other intrinsic advantages of one-story con-





struction. It is suitable for rolling terrain, where the fingers can follow the contours. But it has the disadvantages of requiring a large site, having a long perimeter exposed to the weather and presenting administrative problems because it is distended.

Shorten the Perimeter

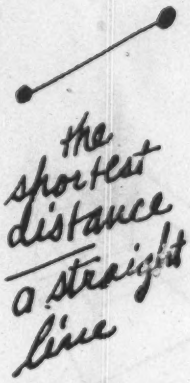
Whether a building is one-story or multistory, you can slice initial construction costs, maintenance and heating by minimizing the amount of outside wall area—by keeping the height and perimeter of wall as small as possible. The wall height, of course, can be kept down by setting ceiling height at the permissible minimum. The perimeter can be shortened by avoiding long, narrow layouts and unnecessary jogs and corners. One technique is to make classrooms rectangular instead of square and place the short sides along the outside walls.

In Canada, a novel school building has just been erected with an unusually small ratio of wall perimeter to floor area. John Layng, of Toronto, Ont., designed it as an addition to the Owen Sound, Ont., school with nearly as short a perimeter for the area enclosed as for a circle. In plan, the building is a 60-sided polygon about 170 ft in diameter. A square structure would have a wall perimeter about 14% larger, and a rectangular building even more.

The structure is two stories high, with a nearly circular, 90-ft dia, 2-story gymnasium at the center, projecting above the main roof. Below, at ground-floor level, is an assembly hall, which also can be used as a cafeteria. The outside ring contains 15 classrooms, 4 interconnecting science and agricultural laboratories, music room, art room, toilets and library. A combination of windows and glass block provides light and ventilation for the interior. Framing consists of structural steel members arranged in a radial pattern for each floor and the roof.

Including the heating plant, the addition cost $556,000. The general contractor, J. Robert Page, Ltd., of Toronto, estimates that this design can save up to 50% of the $22,000 per classroom normally used in estimating Ontario school construction.

Economy can also be promoted by keeping roof lines straight and simple. Not only do breaks in the roof cost more to build but they create a flashing problem and the possibility of leaks, which will add to maintenance expense later.



Aim for Flexibility

While a school may be planned to be low-cost initially, such a plan may be expensive in the long run if changing needs make it obsolete quickly. The best protection against early obsolescence is to plan spaces so they can be used immediately for many purposes and easily converted at a later date, if necessary, to different uses. In addition, it may be desirable to include provision for easy expansion. However, San Francisco's Hugh Hiatt warns:

"In most schools there is some provision for expansion, but we believe there is a maximum size beyond which we shouldn't go. We think the maximum number of students to be accommodated in an elementary school is 600, and in a junior high, 1,200. Right now, some of our new junior high schools have 1,500 to 1,700 students, but we hope to reduce that."

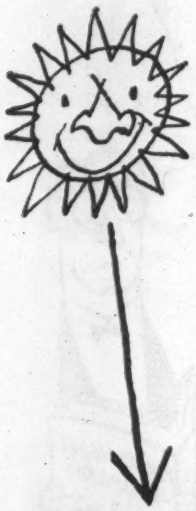
There is some controversy about the economy of movable partitions in providing flexibility. Falk & Booth, Giffels & Vallet and George Hellmuth & Associates, to mention a few, say that movable partitions are usually too expensive. On the other hand, Forrest M. Kelley, Jr., state school architect, Florida Department of Education, among others, finds them worth while:

"Movable partitions contribute to flexibility of layout," he says. "Under some circumstances, where the vertical framing of the structure is kept independent of exterior or corridor walls, even our exterior walls may be regarded as movable. Cabinet work for storage of students' supplies and equipment may also add to flexibility, provided the cabinets are subdivided into units small enough to be regarded as movable."

Ray L. Hamon, chief of the School Housing Section, U. S. Office of Education, suggests erecting permanent skeletons and skins with the idea of completely rebuilding the insides of the school every 20 years.

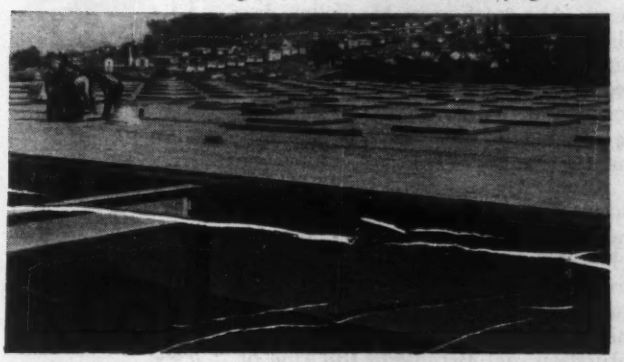
• **Changeable school**—John Lyon Reid, San Francisco architect, is making extensive use of movable partitions in the one-story, 1,750-student Hillsdale High School, now under construction at San Mateo, Calif.

The school plant consists of four major buildings arranged around a central court with swimming pool and diving pool at one end. Along one side of the quadrangle is the classroom building, which is about 500x200 ft in plan. (Because of its size, many of the classrooms are in the interior, making toplighting, artificial lighting and mechanical ventilation a necessity.) At the opposite end of the quadrangle is a gymnasium and auditorium building, 400x150 ft in plan. Along the other sides of the court, in two 280x70-ft buildings, are shops and boiler room, and little theater, arts room and cafeteria.



Reid selected for the classroom building movable metal partitions of the type commonly used in office buildings, as offering the most flexibility and durability. His major problem was to plan other components of the building so they will not have to be moved when the partitions are changed.

For one thing, Reid turned to overhead lighting in the classroom building. Preferring natural illumination for psychological reasons, he made a lengthy study of all available products that could be used for toplighting with daylight and ended up with a 6-ft square skylight of newly developed prismatic glass block, which rejects rays of the sun. Skylights are spaced 14 ft c-c. He grouped artificial lighting fixtures around the skylights, so



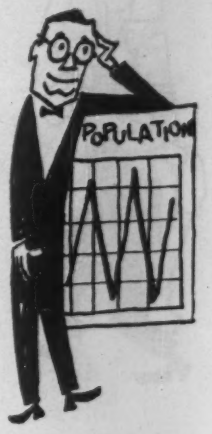
that it will not be necessary to make changes in light sources when partitions are shifted.

For this reason also, Reid designed the heating and ventilating system with outlets around the skylights and artificial lighting units. Electrical convenience outlets can be easily changed through a system of underfloor boxes. Electrical switches are low-voltage and can be moved readily. Plumbing outlets are available in a definite pattern for the installation of sinks or other plumbing as required immediately or in the future.

The classroom building is framed with structural steel, with columns generally 28 ft c-c (cost $257,000, or $1.11 per sq ft). Repetition of units permitted efficient prefabrication and assembly.

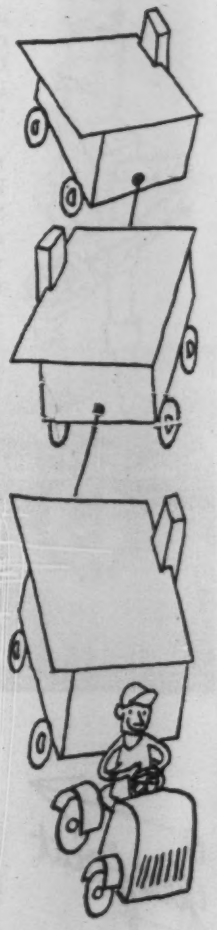
The roof is an insulated steel deck. Floors are concrete slabs on the ground. The exterior consists of metal-panel curtain walls. And the entire building is protected by a fire sprinkler system, making fireproofing necessary only in the large assembly area.

Floor area in the Hillsdale school averages 123 sq ft per pupil (117 sq ft without the auditorium). Total construction cost is $3,775,000 (about $15 per sq ft, $2,157 per pupil), of which $135,000 is for site grading and utilities.



• **Temporary buildings**—Under certain conditions, it might be wiser to use a temporary building than to try for excessive flexibility in a permanent structure. Temporary buildings are helpful when the local population is expanding too rapidly for construction to keep up, or when a population shift is likely to take place within a few years.

Temporary school buildings need not be of poor construction or inadequate for educational purposes, as has happened too often in the past. Recent experience in several cities has shown that a low-cost, efficient and happy solution to a short-time situation can be found either in some of the new-type demountable or portable structures or in buildings that can be converted to other uses at small expense when they are no longer needed as schools.



• **Portable schools**—San Jose, Calif., for example, purchased 27 portable units from Hughes Construction Co. for $226,000 ($8.70 per sq ft) last year. These units were produced on an assembly line at the former San Jose plant of the Mobilhome Corporation of America (the company changed its name recently when it enlarged its operations). Hughes transported them on a trailer to the site, where they were shifted onto prepared foundations.

The units are 24x40 ft in plan. One story high, they are wood-stud construction with plywood facing inside and out.

Los Angeles, troubled by population shifts, also has been making good use of portables. Cost for a series of 392 classroom units, which were added recently to existing school plants, was $7.52 per sq ft, $211.53 per pupil. Generally, a temporary plant is superseded by a permanent one within a year or two. In some cases, the portables have been converted into satisfactory permanent units at relatively low cost.

A typical portable school plant in

2. For auditoriums, consider plain [illegible] The New York Commission on [illegible] School Building[illegible]

Los Angeles consists of buildings that contain classrooms, administrative offices or sanitary facilities. Buildings are one story high, of wood frame construction, with diagonal wood sheathing and generally a cement stucco exterior. They are supported on mud sills directly on the ground. Roofs are single-slope and shed-type, insulated and surfaced with 20-year bonded roofing.

Classroom buildings contain no plumbing; so little site preparation is required. Each consists of two rooms. Lighting is incandescent, and heating is accomplished with individual, gas-fired blower-operated wall units. Administration buildings are similar in outer appearance but have more internal subdivisions. Buildings with sanitary facilities are about half the size of a classroom unit. They provide separate boy and girl toilet rooms at each end, with storage space in between.

• **Convertible buildings**—Many cities, however, deslike temporary buildings as a solution to the changing-population problem. Flint, Mich., for example, prefers units that can be converted into houses and re-sold. The city has had them constructed at an average cost of $11,500 per one-classroom building ($375 per pupil). Conventional schools cost Flint $25,000 to $35,000 per classroom ($1,200 to $1,700 per pupil).

After two years' experience with these ranch-house units, limited to kindergarten through third grade, Spencer W. Myers, Flint superintendent of schools, summarized their advantages at the 1955 convention of the American Association of School Administrators:

a good point

1. These are true neighborhood schools. Because they are attractive, comfortable-looking houses, they provide a much easier transition for the child from home to school.

2. Units are close enough to the pupils' homes to eliminate the need for buses and dining facilities.

3. Separation from older children eliminates associated problems.

4. Teachers report that the self-contained units permit them to know the children much better.

5. Teaching of cleanliness, toilet habits and play habits is closely related to pupils' experience at home; for ordinary home sanitation facilities, except bathtub, are installed.

6. The units can be constructed rapidly—usually in 4 months, compared with 12 to 18 months for a regular elementary school.

7. Small sites can be used. A lot with 60-ft frontage is sufficient.

Built in groups of three and four at a time, the units vary in size from 1,008 to 1,232 sq ft. Floors are concrete slabs on grade finished with asphalt tile, reliance being placed on gas-fired perimeter heating to keep them warm. Construction above the floor varies so that the units can conform with houses in the vicinity.

Flint, Mr. Myers said, is now planning to build intermediate schools for fourth, fifth and sixth grades, with gymnasium, auditorium and offices, supplemented by three or four groups of convertible neighborhood primary units.

Go Easy on Equipment

During the planning stage for a school, it is also a good idea to investigate the possibility of saving money on equipment. However, it is false economy to eliminate needed equipment. Also, as Forrest M. Kelley, Jr., Florida state school architect, points out: "Equipment that serves to a lesser degree the educational utility and efficiency, or that is less durable, should be rejected despite less initial investment."

Alfred Christensen, of Falk & Booth adds, "You must strike a happy medium in selecting equipment. A school takes more punishment and depreciates more than any other public building, probably even more than a railroad station or bus depot. It gets saturation use. Because of this kind of use, you cannot lower the quality of finishes, hardware, furnishings or surfaces. . . . Otherwise, replacement and maintenance costs will go up and you lose in the long run."

worth noting!

Nevertheless, money sometimes can be saved on equipment. Kelley, for example, says that equipment costs may be kept to a minimum through standardization of certain items, such as storage compartments for students' garments and books. But unless you have a big program, standardization alone is not enough. The New York State Commission on School Buildings suggests in addition:

1. Specify ready-made items in stock sizes rather than more costly custom-built items.

2. For auditoriums, consider plain wood or metal seats rather than more costly upholstered seats.

3. School authorities should not delegate to the architect selection of educational equipment and furnishings that educators are qualified to specify.

4. Favor cabinets of soft wood or metal instead of more costly hardwood.

5. Leave off all unnecessary doors on cabinets and shelves.

6. Omit locks on cabinets and desks if they will not be used.

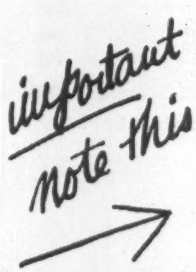
7. Consider wardrobes without doors for students' clothing.

8. Elaborate equipment required for commercial restaurants is not necessary for school kitchens; so use only the quantity, type and size of equipment needed to prepare a typical school meal.

9. Consider composition chalkboards in lieu of more costly slate, metal or glass.

Decrease Power Costs

New developments in electrical distribution, the ENR study showed, are worth considering. The $2½ million senior high school in the Houston, Texas, suburb of Bellaire, designed by Golemon & Rolfe, Houston architects, for example, has a high-voltage distribution system (480Y/277-volt), with low-voltage controls, for which a $20,000 saving was predicted. Economies result from reduction in size of conductors, conduit and panels made possible with high voltage. In addition, fluorescent lighting operates more efficiently at the higher voltage.



Consideration should also be given to a high-frequency (400-cycle) electrical supply for fluorescent lighting. Operation is more efficient than with ordinary 60-cycle current and in many cases, installation costs are lower.

Cut the Heating Bill

The ENR study further indicated how money could be saved on heating and ventilation. Local conditions, of course, must be taken into account.

"Heating problems vary somewhat between northern and southern sections of Florida," says state school architect Kelley. "However, it has been determined that for Florida schools, areas should be zoned so that it is not necessary to heat the entire plant when only portions are open to the public after school hours. In those areas of Florida where it is usually warm by mid-morning, even though temperatures have dropped low during the night, it has been found that the type of heat with rapid response is the most economical and desirable."

The New York Commission on School Buildings recommends a central location for the heating plant to save on ducts. Two boilers independently operated should be installed instead of a single large one. During most of the year, the commission contends, one small boiler operating at near capacity will handle the load with a considerable saving in fuel. Either should be capable of heating the entire building in mild weather. In addition, zone temperature controls offer economies over individual classroom controls. The commission also warns against overdesigning heating plants.

Sometimes package units—boilers completely equipped with burners and fittings—will cost less than boilers equipped on the job . If steam is specified, a low-pressure plant will cost less to install and operate, many designers report.

• **How to save on fuel**—If oil is to be used as fuel, the New York Commission suggests less costly No. 6 Bunker C fuel oil for large installations. This is a heavy oil with a high Btu content; it requires preheating, but the savings in fuel costs should more than offset the cost of the extra equipment. Lighter fuel oils, however, may be more economical for small plants.

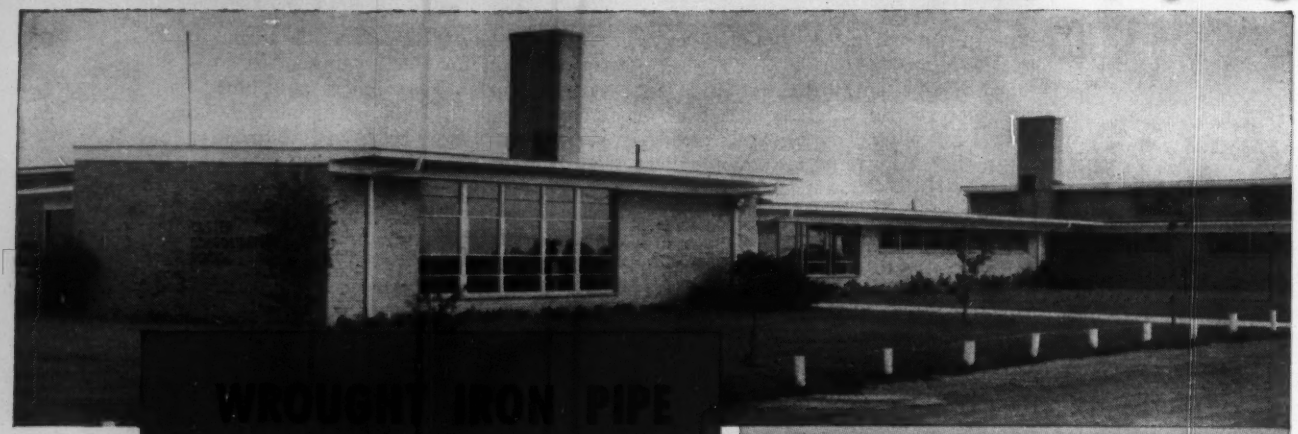
If coal is to be used as fuel, the commission recommends equipment with grates that permit burning fine, low-cost coal when a stoker is not included. However, use of a stoker for at least one boiler should be considered, for fuel costs will be reduced and the building more uniformly heated than when hand-fired.

Windows and exterior doors should be weatherstripped to reduce heat loss. Fuel savings will more than offset the cost.

"You can save by insulation, too," adds Mark Falk. "Since there are so many windows in schools, it is hardly feasible to insulate the walls, but we almost always insulate the roof."

"Ventilation is more a problem than heat," Falk continues. "We are trying to get away from panel and floor heaters, since they don't ventilate at all. We have been very successful with unit heaters, which are half the cost of unit ventilators. They take in some outside air, and are hand-controlled, while unit ventilators are mechanical. We've installed quite a number of unit heaters and have had no complaints; teachers seem to find them adequate.

"Classroom installation of panel heat in a California school now would cost $1.30 per sq ft, based on total building floor area. Unit ventilators would cost the same or slightly more. But unit heaters would cost only



WROUGHT IRON PIPE

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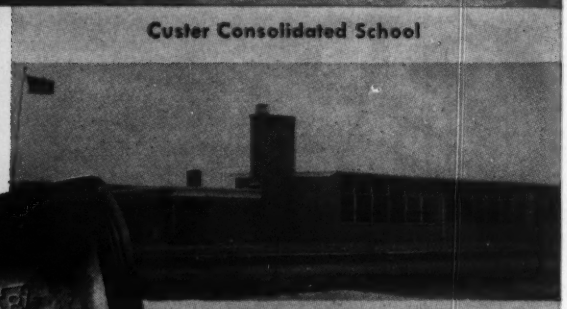
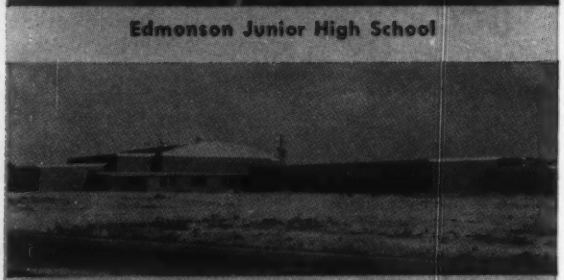
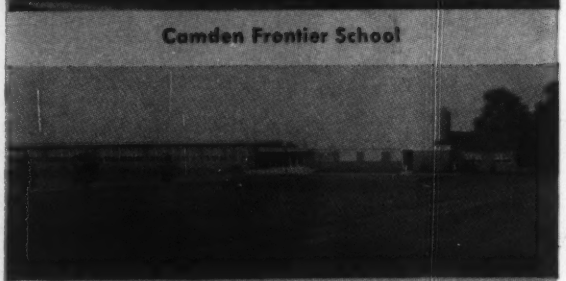


Custer Consolidated School

Lakeshore School



Edmonson Junior High School



Camden Frontier School

Ladywood High School

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$0.70 to $0.80 per sq ft." Others suggest only window ventilation and power exhaust. (See, for example, "Classroom Comfort Thru Natural Ventilation," by W. W. Caudill and Bob H. Reed, School Plant Studies BT 1-3, American Institute of Architects.)

Reduce Plumbing Costs

Costs can be cut on plumbing, too, the ENR survey shows. Placing boys' and girls' toilets back to back, with pipe-access space between, will shorten piping runs and cut repair bills. Locating a battery of boys' and girls' toilets near the auditorium where it can be used by the public will eliminate duplication of facilities.

For primary grades, toilets could be placed to serve two adjoining classrooms with economy. In multistory buildings, toilet rooms should be placed over each other. In boys' rooms, doors can be omitted.

How to Save In the Construction Stage

The ENR study of ways to stretch the school building dollar was equally as productive of suggestions for cutting costs on structural and enclosure items as it was for general planning.

There was unanimity among designers on the advantages of repetition of components and of modular coordination (sizing of building components so they fit on the job without the need for cutting and without waste). The argument was also advanced that there is economy in using larger, and therefore fewer components for structural members, walls, partitions, floors and roofs.

Where possible, the design should favor construction with power tools. On the other hand, construction that requires unusual and costly equipment should be avoided. And in addition, thought should be given to selecting construction types that require a minimum of different labor crafts that might interfere with each other on the job.

• **Minimize ornamentation**—To keep costs down, architects are trying to achieve esthetic effects with materials needed anyway for the building, not with added decorative materials. They are getting desired effects principally with mass, color, texture and materials in proper relationships.

In many cases, architects say, structural members can be left exposed; but before this is done, the effect on fire-insurance premiums should be checked. Frequently, too, brick or concrete block walls are left untreated except for paint. But intricate patterns that are expensive to lay should be avoided.

Cork or fiber board or wood strips are suggested as combined wall coverings and tackup surfaces in classrooms. And asphalt tile is frequently recommended as a floor finish on concrete in classrooms for economy.

• **Use multi-purpose materials**—Construction costs generally can be cut by selecting materials that can serve more than one purpose at a time. When acoustical ceilings are desired, for example, you might save money with a material that not only is economical to install for its principal purpose but can also serve other purposes without additional cost. For example, a triple-purpose material was used for the ceilings of the Clinton High School, Clinton, Conn.; Perrysburg Elementary School, Perrysburg, Ohio; and the Blue Ridge High School, Greenville County, S. C., to mention a few. It is a glass-fiber board, produced by Owens-Corning Fiberglas Corp. Supported on light, inverted-T sections that span between roof joists, the board is used as a form for a cast-in-

place gypsum roof deck, as thermal insulation for the roof and as a fire-resistant acoustical ceiling. The manufacturer says the form board plus gypsum deck costs no more than the usual acoustical ceiling alone—about 50¢ per sq ft for an installation of 25,000 sq ft.

Another example of a multi-purpose ceiling installation is the light-gage steel panel system just developed by

Detroit Steel Products Co. and now being applied in 23 new schools in Detroit. Designed for integration into reinforced concrete construction, the panels serve as pan forms, acoustic treatment and fluorescent lighting troffers. As forms for concrete, they need be supported at midspan and ends only, saving on shoring.

Still another example is the roof construction used for two schools in East Hartford, Conn., designed by Brewer & Austin, architects, with Henry A. Pfisterer, New Haven, as the structural engineer. (Hartford awards design contracts in pairs to save on the architectural fee.) The roof consists of builtup roofing atop 3-in.-thick precast concrete panels made with wood aggregate. Not only do the panels form the structural roof deck but they also provide thermal insulation and acoustic treatment at the same time.

• **Saving labor on ceilings**—Some new installation methods also show promise of cutting the costs of putting acoustical tile in place. A good example is the ceiling in the 20-classroom Thomas Jefferson Elementary School at Levittown, Pa. (This is one of two schools designed and built by Levitt & Sons, with Oliver Marron as architect. The building was leased to the local board of education, which was not in a financial position to meet the school needs of the rapidly expanding population.) For one thing, Levitt used tiles 24 in. square instead of 12-in., saving time and labor. Secondly, they were quickly fastened to wood furring strips by inserting aluminum splines in the kerfed tile edges and stapling the splines to the wood with an air tacker. Fiber splines were inserted at right angles to the aluminum splines for leveling purposes.

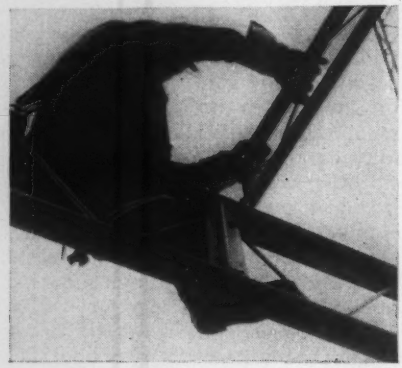
Slice Framing Costs

Perhaps the most difficult suggestions to evaluate are those related to structural framing, for its economy is heavily dependent on local conditions. Furthermore, so many variables are involved in cost comparisons that final selection of any material or structural system usually is a matter of personal engineering judgment.

In the Northwest, for example, Johnson, Botesch and Brown, architects-engineers, Everett, Wash., report low costs with glued-laminated wood construction. In the East, a similar report is given by George J. Dippell, architect, Massapequa, N. Y. He estimates savings in the order of 35% compared with other types of construction.

But in East Hartford, Conn., Henry Pfisterer used for several one-story schools a factory-type structural steel frame, with columns spaced 24 ft c-c and purlins 8 ft c-c. The frame was erected in 12 hours. A precast lightweight concrete roof deck was set in place within three days. With pumice-concrete block walls and prefabricated frames for story-height windows, the shell cost $3.50 per sq ft.

Similarly, from different parts of the country come reports that savings have been made with light-gage steel framing. Anderson-Nichols & Co., Boston, says the Daniel J. Murphy Elementary School, Natick, Mass., with nailable steel framing and redwood siding on the exterior was unusually low cost. Walter T. Anicka, Ann Arbor, Mich., also found school building costs low in Michigan last year with Macomber V-Lok framing, in which open-web



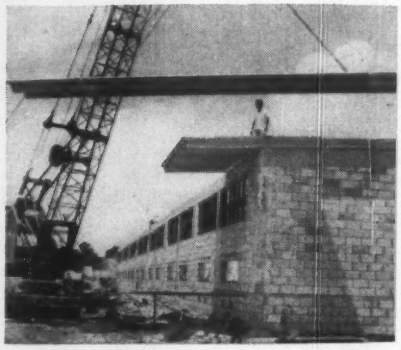
steel joists are swiftly hooked into supporting members. (Macomber reports that the demand for this type of framing has increased so much that it has been forced to double its plant capacity and staff.) And John B. Richards, Bound Brook, N. J., is using light-gage framing in two New Jersey schools.

Proponents of concrete construction, too, claim savings. William C. Tyler, of Arrasmith & Tyler, Louisville, Ky., for example, reports cost reductions of 15 and 20% with the lift-slab technique. This method calls for casting of concrete slabs for floors and roof at ground level and raising them into position with jacks atop previously erected columns. Tyler says the lift-slab method cut construction time 40% on the two-story Cotter Elementary, Lucie N. Duvalle Junior High School, Louisville (below).

Philip Will, Chicago architect, says that repetition of reinforced concrete framing for Keokuk High School and Community College, Iowa, permitting re-use of forms, made cast-in-place construction "extremely economical." But for other schools, he also has found exposed open-web steel joists with lightweight precast concrete roof decking economical.

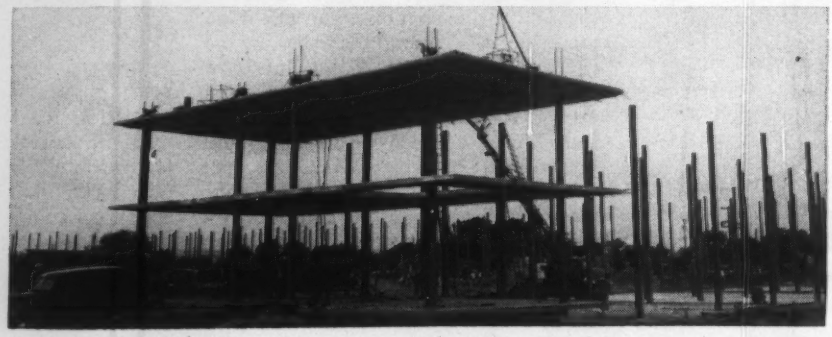
Johnson, Botesch and Brown, mentioned previously as having turned out economical wood-framed schools, also have had low construction costs with precast concrete framing and point to the additional advantage of a low fire-insurance rate. Precast framing is also being used by Micklewright & Mountford, Trenton, N. J., architects, and Isadore Thompson, San Francisco engineer, to mention only a few in widely separated parts of the country.

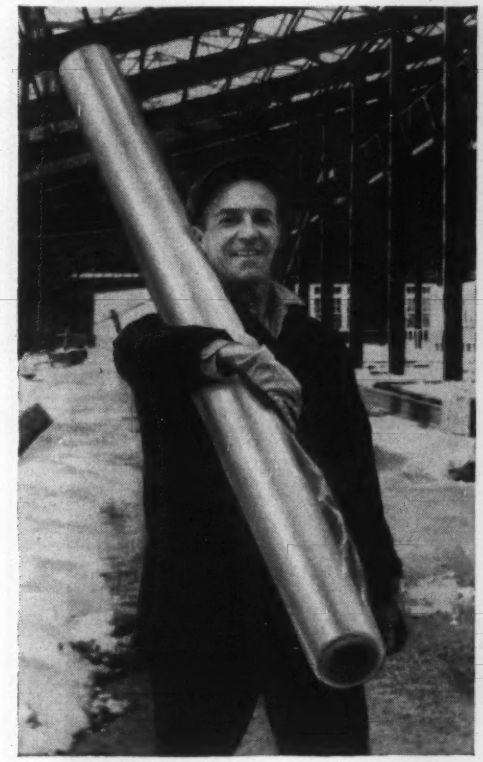
Structural members and roof deck were combined into one element with economy for the one-story Dillard Elementary School, Ft. Lauderdale, Fla. R. H. Wright & Son of that city used precast, prestressed concrete members to span between concrete-block bearing walls. Developed by Lakeland Engineering Associates, Inc., Lakeland, Fla., the units consist of a 4-ft-wide top slab and two joists.



Similarly, beams made of concrete block have been placed side by side to form a roof deck in several Cleveland, Ohio, schools at an estimated 10% savings compared with cast-in-place concrete.

When flat roofs are used, a slope for drainage of rainwater generally is built up with roofing materials. David





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Eggers, of Eggers & Higgins, New York City architects, suggests that money can be saved by leaving the roof dead flat but with drains spotted at frequent intervals. Most water will spill over into roof drains anyway, he says, and the rest will evaporate.

Economize on Walls

Suggestions for saving money on wall construction are difficult to evaluate because walls are intimately related to architectural treatment and are greatly affected by openings for entrances, daylighting and ventilation. The lowest-cost, efficient solution may not satisfy local conditions and esthetics.

For example, many communities prefer masonry walls for school exteriors and are willing to compromise for economy by leaving the interior unplastered. Where this is not acceptable, consideration might be given to cavity-wall construction, with plaster applied directly to the masonry, thus at least eliminating the expense of furring. Norman J. Aaron, assistant superintendent of Fulton County (Ga.) schools suggests, in addition, that consideration be given to common clay brick for the exterior (at about $26 per M) instead of face brick (at $40 per M and up).

On fenestration, Aaron points out: "Many architects want us to let them use large sheets of glass in window areas but we insist on smaller sections to fill the same area." He also visualizes savings of about 20% with commercial projected sash in lieu of architectural or similar types.

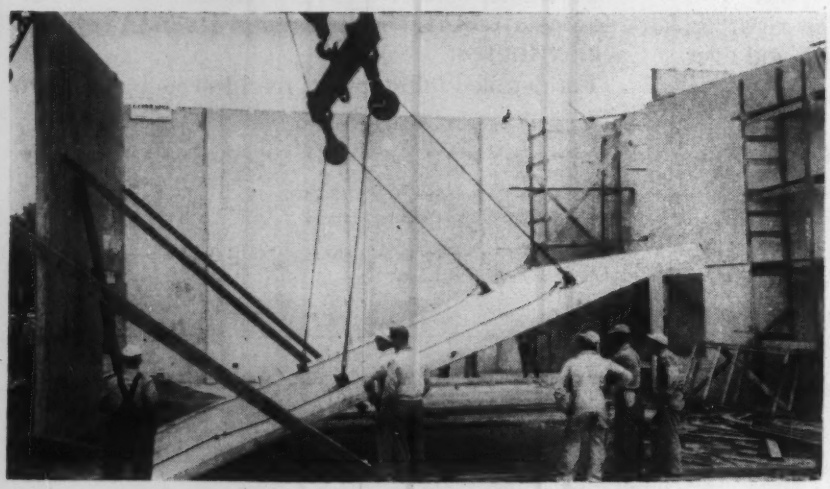
• **Precast concrete walls**—Large-size panels of concrete have been used for school exteriors, the study reveals, and where in conformance with desired architectural treatment, may prove an economical wall construction—especially when no additional interior or exterior finish is required. They permit significant savings in formwork and erection time. For the new Woodbridge, Conn. school, for example, Fletcher-Thompson, Bridgeport, Conn., architects-engineers, called for 6-in.-thick concrete walls. Panels weighing up to 30 tons were cast on the site adjacent to their final position and tilted into place with a crane.

Large concrete panels can also be purchased factory fabricated. Walls for a 70x100-ft gymnasium for the Windsor Local School, Stockport, Ohio, designed by Scott & Easley, Marietta, Ohio, architects, were erected in only five hours with a 6-man crew and a crane, at a cost of $2.34 per sq ft in place. The panels, manufactured by Marietta Concrete Corp., were sandwich type; they consist of two 1¾-in. reinforced concrete layers with 1½ in. of insulation between. For this project, panels were about 10x8 ft by 5 in. thick.

• **Metal walls**—Successful use has also been made of metal panels. Johnson, Botesch and Brown, for example, specified both aluminum and porcelain-enameled steel for the new high school in Ketchikan, Alaska. Sherwood, Mills & Smith, Stamford, Conn., architects, have employed porcelain-enameled steel for several Connecticut schools, and Perkins & Will are using it in some Mid-West schools.

Frequently, additional savings can be made by keeping panels to a weight and size that one or two men can carry, by cutting down on the number of different panel sizes needed for a building and by using panels in conjunction with prefabricated frames in which windows also may be incorporated.

In many instances, glass block that directs light upward for reflection from the ceiling is being used extensively in wall construction for schools to improve daylighting distribution in classroom interiors and reduce the need for artificial lighting.



• **How to get low bids**—When all the money-saving ideas that can be possibly made in the design stage have been incorporated in the plans, it is still possible to stretch the school building dollar even more:

1. By preparing plans and specifications that are complete and exact, to make it unnecessary for contractors to pad bids to cover unforeseen contingencies.

2. By writing specifications to permit acceptable competitive materials, and construction methods, but with the number of alternates kept to a reasonable minimum.

3. By combining several projects in one bid, if they fall in a relatively small area. (Miles Sheffer, assistant director of the Georgia State School Building Authority says, "It has been our experience that combined bids run anywhere from 3% to 8% lower than individual bids due, of course, to the use of the same materials and structural system in all the schools involved."

4. By advertising for bids when building activity is at a low ebb and building contractors are eager for work.

5. By allowing contractors sufficient time to obtain dependable bids from subcontractors and suppliers (not less than three weeks, preferably at least four).

6. By allowing a reasonable time for completion of the project.

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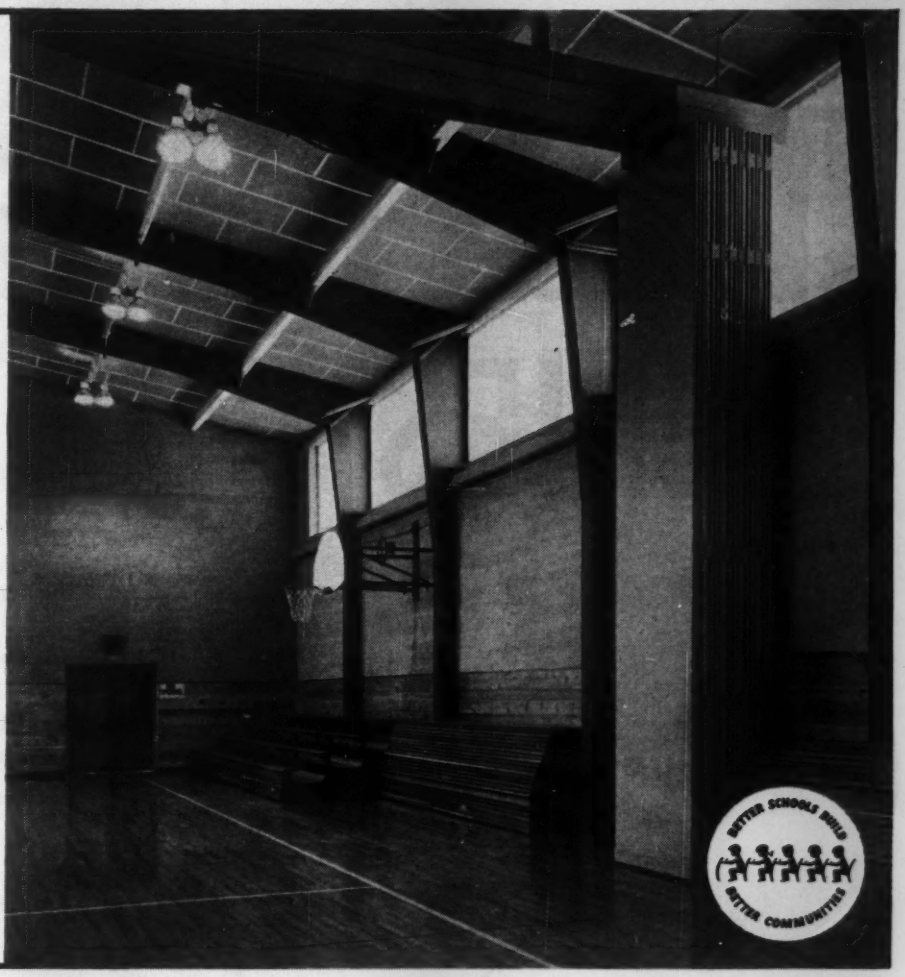

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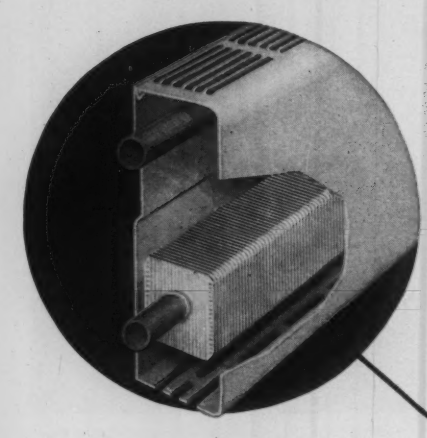

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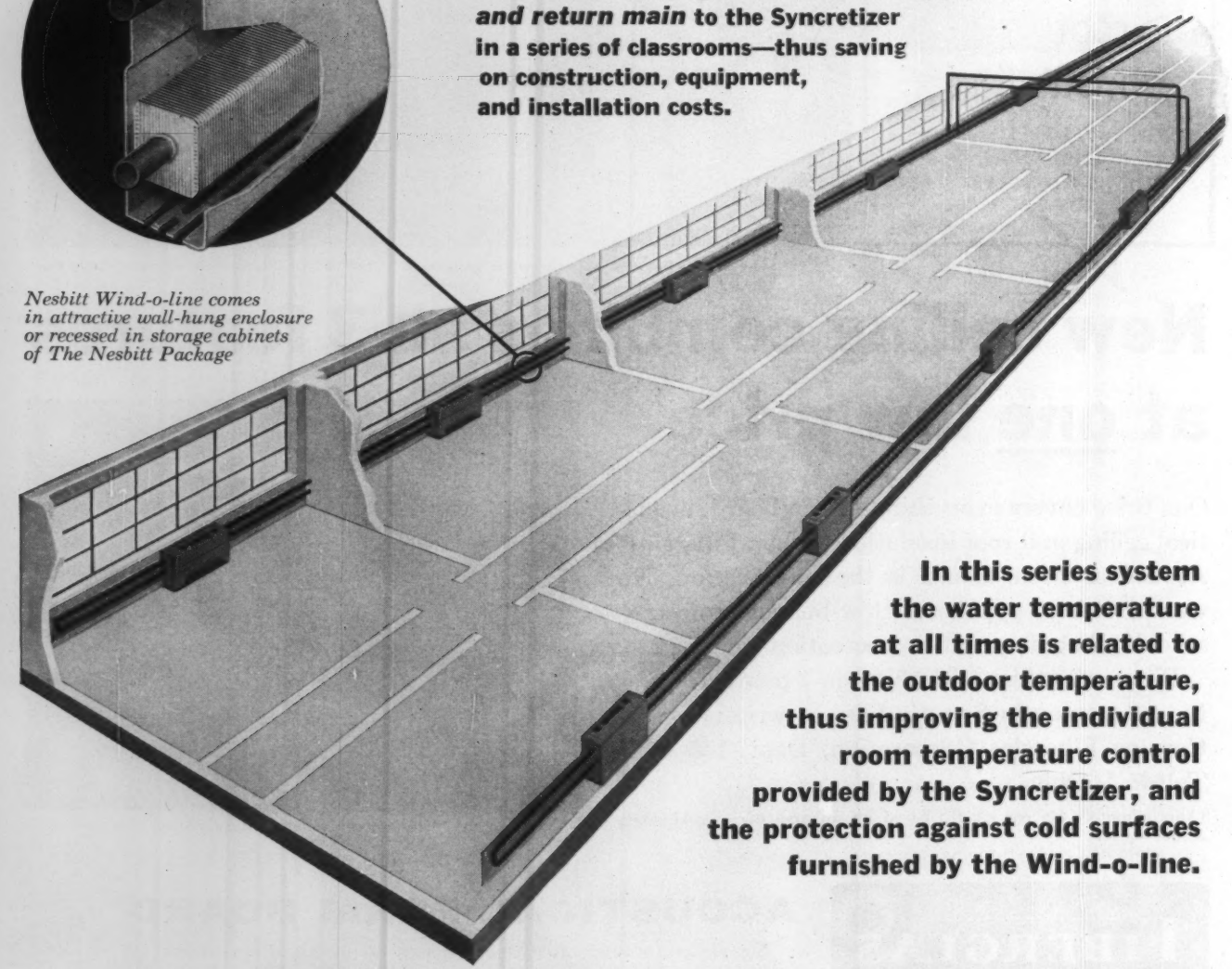

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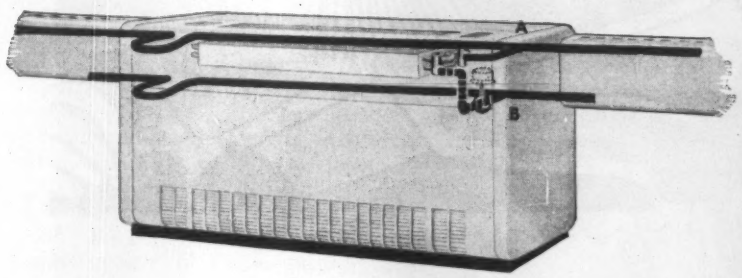

Packaged piping reduces installation cost. (a) Crossover return tubing, expansion loop, and air vent fitting come pre-assembled and connected to the heating element. (b) Crossover supply tubing, expansion loop, and balancing valve are furnished installed, leaving a minimum of piping at the site.

IF YOU are interested in school construction costs, it will pay you to study how this latest Nesbitt development meets today's needs and gives more for the school-building dollar.

In forced hot water applications Nesbitt Syncretizer heating and ventilating units with Wind-o-line radiation may be installed in series-loop circuits, in which the copper tubing of the Wind-o-line system serves as the only required supply and return piping for multiple-classroom groupings or entire wings.

COSTS REDUCED *Savings in equipment:* Smaller pipes and pumps are required because the Nesbitt System is designed to provide the needed heating capacity with water quantities of from one half to one third those required in conventional systems. Saves on both first cost and operating cost.

Savings in construction: Wind-o-line supplies Syncretizers, eliminating costly pipe trenches, mains, runouts and pipe covering in much of the building. Other piping is simplified.

Savings in installation: Mains and piping are smaller, shorter, simpler. Packaged piping within the Nesbitt Syncretizer unit ventilator reduces installation labor at the site. See above.

COMFORT INCREASED *Variable water temperature control:* Relating the available heat directly to outdoor temperatures improves the control of individual room temperature by the Syncretizer.

Improved cold surface protection: Because the system water temperature increases as outside temperature falls, Wind-o-line protection against cold window downdraft and bodily heat loss is continuously related to actual needs.

Off-time temperature maintenance: Without additional investment in equipment, the Nesbitt System maintains safe basic building temperatures during overnight, holiday, week-end shutdowns.

The Series Wind-o-line System offers you these

advantages

Improved room temperature control

Increased protection against cold surfaces and window downdraft

Costly pipe trenches are eliminated

Pipe covering and traps are eliminated

Smaller pumps cost less and operate with greater economy

Mains and piping are shorter, simpler

Packaged piping within the Syncretizer reduces installation costs

No additional controls and equipment are required for night heating

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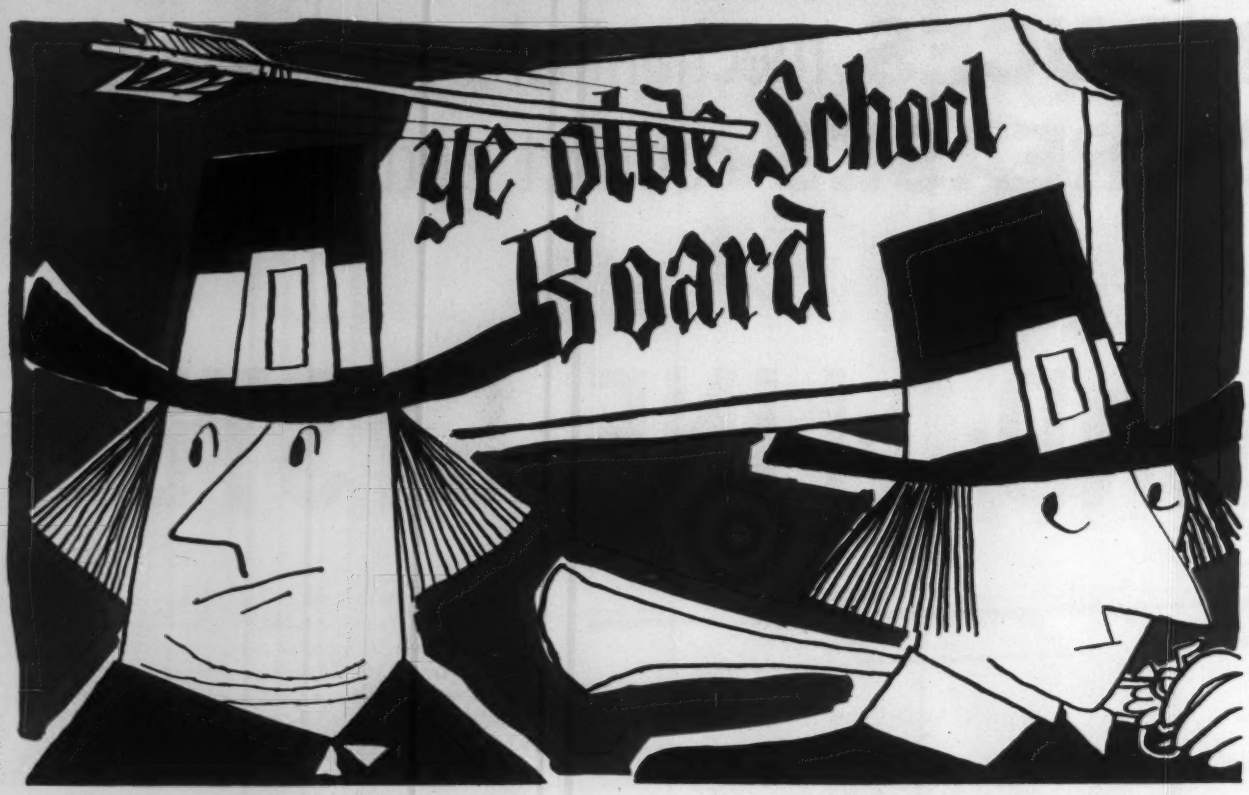


The Right Way to Go About Building a School

Back in the 17th century, Massachusetts colonists set up the first board to handle school problems on a local level. Today 350,000 board members in 63,000 school districts supervise spending of $2.5 billion for new construction, $6.3 billion for school operations—and are responsible for $16 billion worth of school property.

In most communities, the school board is made up of laymen who may have had little or no experience with construction. Charged with the responsibility of a school building program, they have to deal with such problems as selecting an architect, arranging for financing, getting advice on design and construction, picking a site, selling the school plan to the community, choosing the contractor, and checking on construction. At the same time, architects and engineers face the problem of designing and building a school that meets with the approval of the school board.

Many check lists have been set up to guide school boards in conducting their construction program. A simplified one might be:

- Organize a planning committee
- Hire an educational consultant
- Make a school building survey
- Determine educational needs
- Appoint an architect
- Prepare educational specifications
- Select a school site
- Approve preliminary plans
- Arrange for financing
- Approve working drawings
- Call for bids
- Choose a contractor
- Check on construction

But the details involved in building a school are not as simple as merely checking off steps on such a list. An analysis of the major problems faced by architects, engineers and school boards in their mutual dealings follows in the story of Oakwood Park, a fictional but typical community. The viewpoints expressed are real, though representing a composite of the best thinking by experts on school construction.

Until a few years ago, Oakwood Park was a typical residential town on the outskirts of a midwest manufacturing center. Then a large-scale home building program gave a sudden boost to its population, and school officials were faced with the problem of housing hundreds of new students.

• **Overcrowded schools**—The situation in School District No. 2 was urgent. Its three schools were built to handle 1,700 pupils at capacity. Enrollment reached 2,300. Classrooms from the two elementary schools overflowed into churches and stores. The junior-senior high school, which bulged with twice as many students as it was meant to hold, had to schedule double sessions.

The task of dealing with mushrooming schools rested on the shoulders of a local five-man board of education working with Superintendent Smith. The board members knew little of the complex demands of a school building program. In addition, Superintendent Smith was new to the district and unfamiliar with its peculiar problems.

"Know Thyself"

Looking back now, School Board President Baker blames unpreparedness for crowded conditions on the district's lack of long-range planning.

"We didn't look far enough ahead—our data wasn't up-to-date. We thought we had anticipated district growth, but we didn't count on home building jumping from 2,300 to 4,600."

The board, spearheaded by Superintendent Smith, began to review and re-evaluate its program by means of a school plant survey.

"We considered two ways of making the study—independent and cooperative," reports Smith. "The independent method meant setting up a separate survey organization—myself plus teachers and principals—to work full time on the project. Or we could have called in specialists from outside the school system to do the entire job. In either case, the survey would have been the sole responsibility of those staffs."

Smith believes that an independent survey has advantages. "It causes a minimum amount of disruption in the regular school program. And the job can be done expertly in a minimum of time. But our district is small and we decided to involve the community in cooperative planning."

The school board picked a citizens advisory group. It included members of PTA and civic organizations, State Department of Education specialists, professional educators, heads of college education departments, representatives of regional agencies, local architects and engineers, teachers, principals, pupils and school maintenance personnel.

• **Enter the educational adviser**—To guide the local staff, the board secured School Building Consultant Cassidy from the State Department of Education.

Cassidy's primary service was to help the building committee get the best possible schools for the lowest possible cost. His duties covered a wide range of activities. He made a complete school building survey of the local system, of community growth, of the financial health of the town. He helped plan the educational program. He aided in defining the most efficient administrative policy to be followed in the new schools. He determined an efficient schedule of necessary rooms with minimum dimensions. He located rooms to facilitate administration of the buildings.

Since Cassidy was able to set up educational policies and present a clear statement of building needs, he saved the architect time and wasted effort in drawings.

"Some architectural firms," Smith points out, "have experienced educators to assist as consultants. These firms, offering service of both educational consultant and architect, should be employed from the beginning of the planning period. However, there are those who feel that the consultant should be directly responsible to the school board for compensation."

• **What to pay for advice**—As a rule, consultant's fees are based on an agreed percentage (ranging from ¼% to 1%) of the estimated cost of the building. When the consultant makes only the preliminary building survey, the fee varies with the size of the town and kind of report desired. Sometimes, after the preliminary survey has been made, the board decides to continue his service in planning a building. Then the amount paid for the survey may be applied toward the total fee on a percentage basis.

• **What you need to know**—"Our first job," recalls Cassidy, "was to define the educational program. This stated the school's curriculum, services and

teaching methods. It also established school and class sizes.

"Next we charted and mapped enrollment data. Past, present and estimated future school population told us the number of children to be housed, grade-by-grade, year-by-year. We considered population characteristics, growth and migration; private and parochial school attendance; school district organization."

The third part of the survey was a weighty one: To evaluate existing school plants. "We wanted to know if our schools were safe, accessible, economical, attractive, useful," says Cassidy. "And if they had adequate facilities for the educational program desired. The State Department of Education provided a suggested scorecard for rating the buildings, also a form for taking inventory."

Cassidy continues: "We considered the site angle, too. Is the land suitably located for continued use? Can the site be enlarged? Is the environment desirable? Answers to these questions helped decide whether schools could stay in present locations for another 25 years."

• **Modernize or replace?**—There were other evaluations to make. Could any of the present schools be abandoned in a long-range plan without modernization or replacement? The district didn't want to spend a substantial sum of money to modernize even a sound structure if there wasn't a long-term need for a school in that location.

Architects and engineers on the building committee checked characteristics of the structure to see if they presented serious obstacles to alteration, remodeling and expansion. The district didn't intend to sink a large amount of money into a structure that wasn't basically sound.

Then there was the question of what must be done to make the building conform to local health and safety codes—and to state or local educational space standards.

"We also compared modernization cost with that for replacing the buildings," says Cassidy. "Would savings through modernization be offset by differences in space standards, period of usefulness, cost of insurance, operation and maintenance?"

After taking stock of the situation, the building committee decided that the solution to its immediate problem was in new school plants, not enlarging present schools. Expense made expansion impractical. Since the schools were not built for expansion, there would be tearing down and new construction. Moreover, almost any addition to the schools would not only result in an architectural monstrosity, but would mean adding to non-fireproof buildings. Too, more rooms would aggravate present problems in cafeterias, libraries, locker rooms. And all three schools were badly pinched for outside space.

• **Will funds be available?**—The fourth part of the survey took up the financial framework of construction costs. Committee studies determined assessed valuation of the district; present indebtedness; legal debt limitations; sources of school revenue and expenditure trends; tax rates of other government units; possibility of changing the tax base by district reorganization.

As soon as the financial picture was complete, the board studied survey results and made a statement of needs. This included immediate construction of a 600-pupil elementary school and an 800-pupil high school.

Now the board was ready for site

. . . Pick architects on the merit basis

acquisition—and that's when the architect was selected.

Selecting the Architect

"We found out," recalls Board President Baker, "that selecting an architect is not always easy, even with advice from our educational consultant and State Education Department.

Local pressure presented one problem. Baker sums it up: "Even if the local architect knows nothing about school building, there often is political interference to pick him over an outside firm. Many boards hire a local firm—then select a school architect as consultant. Or they depend on educational consultants to offset any deficiencies in a general architect."

"If additional schools are built, the board faces pressure for a 'rotation' of architects. There is a feeling that work should be distributed among various local architects. If this is done, the board constantly is starting from scratch with an architect who may have ability but who knows little about technical school construction."

Baker, however, believes that a local architect often is just as good as any firm having a wider reputation. "If local firms are competent, there is no reason why they shouldn't be chosen. In fact, there are arguments in favor of it. For instance, they are right on hand for close consultation with the educational staff. Also, it's easier for them to determine responsibility of bidders."

• **What type of firm is best?**—Should a school board choose a nationally known or unknown firm? Baker: "We expect a nationally known firm to have established its reputation through experience and quality of work. But this isn't always the case. The firm could have developed its name through a public relations effort that had nothing to do with quality of work. Or the reputation may come from adoption of unusual and experimental designs that turn out to be costly or impractical."

The board also had to decide whether to hire a school architect or a general architect. "We understood," says Baker, "that a school architect is a specialist in his field and that it would be wise to choose him for his particular skill. On the other hand, if we considered only school architects, it would eliminate many excellent young architect firms. It also would keep out experienced architects who never had a chance to design schools."

Some boards select architects by organized competition in which candidates submit proposed designs for buildings. But, the American Institute of Architects warns that competition and fees form an unsatisfactory basis for selecting architects.

• **Compare past work**—The AIA recommends the merit basis: A review of professional qualifications and excellence of past services. The AIA and National Council on Schoolhouse Construction have approved a standard form questionnaire for school boards to use in collecting information on architect qualifications.

"Our first approach to selecting an architect," says Baker, "was to talk with neighboring boards who had recent building experience. This led to names of several architect candidates. Superintendent Smith also recommended firms that had established reputations as school architects. We scheduled personal interviews. Candidates showed us what they had done and answered questions in regard to their work."

The board soon discovered that there is no blueprint of architect's qualifications. School designers should have qualities common to all good architects: creativeness, technical knowledge and skill, tact, integrity, business ability, thoroughness, practicality, ethical soundness. But there were other things to consider.

"We looked into professional standings with the local AIA chapter—and into banking references," says Smith. "We checked to see if the architect had a staff and services available. If not, we wanted to know his policy in obtaining engineers and site planners.

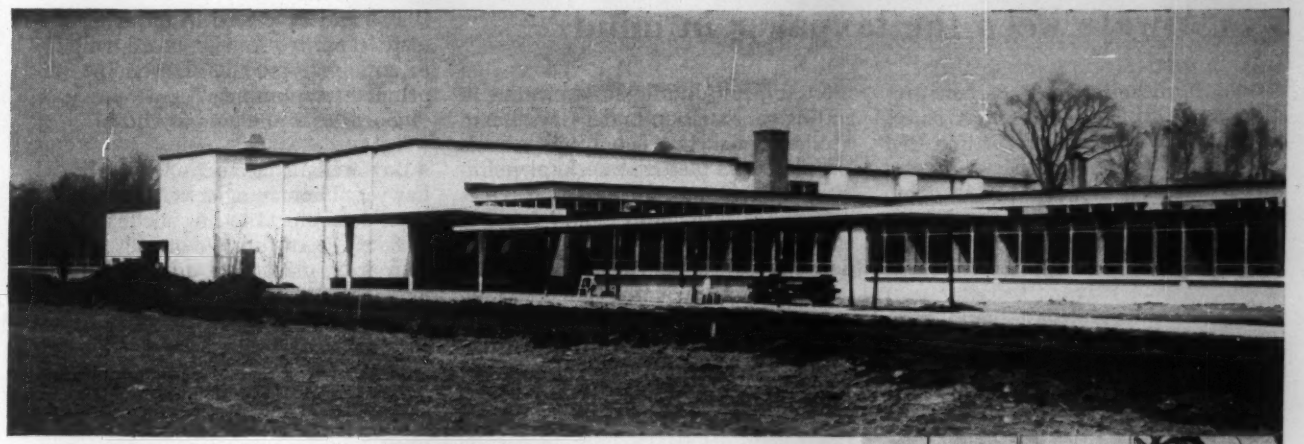
The board also checked on the architect's business procedures to see if his record keeping was sound, if he gave adequate supervision during construction, and if he was careful in meeting state and municipal codes.

"We didn't want extra costs arising from omissions in drawings or specifications," adds Baker. "So we made certain that the architect prepares careful and complete drawings. And we checked to see if he keeps up with new design and construction developments as well as trends in educational practices."

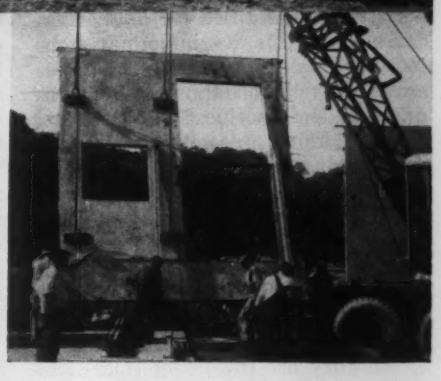
One of the biggest sources of information on architect qualifications was former clients—educational advisors and contractors. "We also visited some of the architect's projects and talked with people using the buildings," says Baker. "We saw for ourselves if the architect economized in use of space and materials and if buildings were attractive without undue ornamentation."

• **The design contract**—Qualities discovered in inquiries prompted the board to hire Architect Anderson. The schedule of charges recommended by the AIA served as a guide in setting his fee (in this case, 6% of the construction cost of the projects), and the contract was based on the AIA standard form. It outlines obligations of both parties and includes a schedule of fee payments that determines how much is due at certain project stages. These forms vary in detail regarding fees for engineering services and equipment. But with some modifications to meet local conditions they serve in most situations.

"My contract," declares Anderson, "was very specific about services I



Why They Used Plastiment in Connecticut's "Lowest-Cost-for-Highest-Quality" School



Using tilt-up construction methods in this school at Woodbridge, Connecticut, the contractor steel-trowelled the Plastiment-concrete floor slab, coated it with a parting agent, and cast 120 6-inch-thick Plastiment-concrete wall panels directly on the floor surface.

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. . . Always keep the taxpayer in mind

would furnish, the cost of construction upon which the fee was based, and the services and information that the district would furnish me. It's not the architect's responsibility to determine educational needs of the district. I expected detailed data on the education program."

• **What an architect should do**—"Speaking of duties," Anderson emphasizes, "I've found out that school boards seldom make full use of architect services because they don't know what they are entitled to."

Anderson lists five important architect services: Preparation of preliminary plans, preparation of working drawings and specifications, assistance during bidding, preparation of contract documents, and supervision during construction.

• **How cities handle school design**—The use of architects varies throughout U. S. school systems. The AIA has surveyed 53 cities (population: 200,000 or over) to find out the extent to which they use private or staff architects.

Questionnaire answers fall into four categories: 18 school systems use private architects exclusively; 23 use private architects and also have a staff architect (or engineer) who coordinates work of private architects, and/or performs maintenance and minor repairs; 4 use private architects and also have a staff architect who prepares plans for some projects; 5 use a staff architect exclusively—3 of these (Chicago, Syracuse, N. Y., Washington, D. C.) use municipal architectural departments for staff purposes.

Picking the Site

Site selection was one of the first problems the board took up with the architect. Anderson and his civil engineer associate took over the job and charged the district for it in addition to the regular fee. Anderson points out: "Unless it's clearly understood that the architect will provide such services, it's a good idea for the board to hire a site planner early in the planning period. Most state departments of education have a list of planners who have done state work."

Superintendent Smith strongly recommends that the board have competent legal counsel during site selection. "Sometimes sites are obtained by direct negotiation and purchasing, sometimes by condemnation. But often several owners are involved and proceedings may be complicated."

Site selection often proves to be the most difficult hurdle to overcome in getting construction under way. Board President Baker: "Too often schools are placed to please some local politician, PTA group or real-estate promoter. Local prejudices and ignorance as well as personal interest can delay needed construction or cause compromise on an inadequate site."

• **Will interests conflict?**—Oakwood Park's Planning Commission had much to offer in relating site choice to environment. John Green, head of the Commission: "Schools must be protected against any neighborhood land-use pattern that would have an unfavorable effect—and against development of nearby streets into main traffic arteries. If school boards consult the city plan, they won't take the risk of having their plants hemmed in by business houses and factories, or endangered by thoroughfares. The city plan also can relate the site to community facilities such as parks."

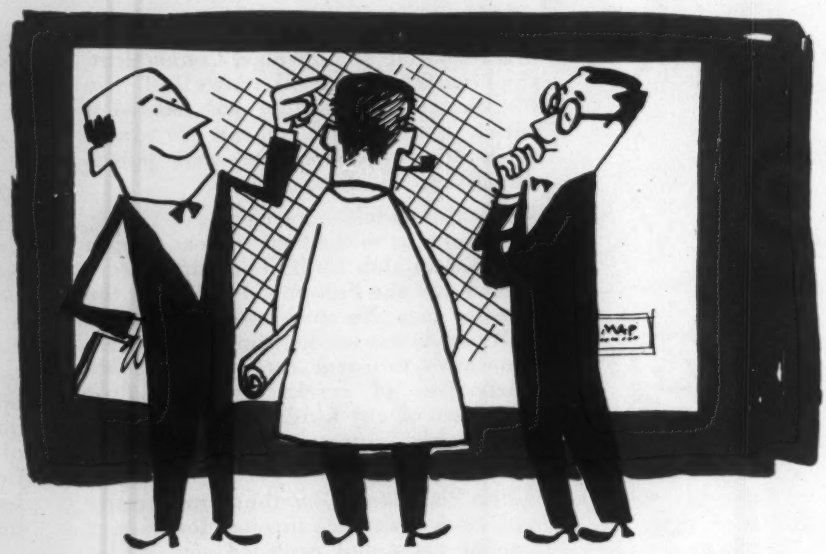
• **Provide for expansion**—Architect Anderson: "In unplanned communities, school site size often is determined by accident. I usually rely on three basic requirements: the educational program, student ages and classifications, number of students to house. A number of states suggest a minimum site of 5 acres for elementary schools and 10 acres for junior and senior high schools—plus an additional acre for each 100 pupils of predicted maximum enrollment."

Anderson warns school boards not to plan a school that can't grow without cramping the area. "Every school site should be placed in terms of ultimate capacity. A wise board will try to anticipate growth of even the unplanned community and purchase school sites while land is cheap."

• **Buy well in advance**—School Board Lawyer Thomas agrees. "It's usually more economical to buy adequate sites to take care of future demands instead of waiting until need arises. Through long-range planning it might be possible to get undeveloped land at low cost. Perhaps 20 years would elapse before tax loss and investment interest would bring total cost up to what would be paid if purchase were delayed until actual construction."

The board also considered shape and contour of sites as well as orientation to needs, elevation and drainage, soil character. "Many districts," says Anderson, "have run up unnecessary construction costs because of unknown unfavorable soil conditions. This could have been known through test borings made by an engineer."

"We considered feasibility of building on the sites from an architectural and engineering standpoint," says Superintendent Smith. "Also the cost—including structures to be moved and razed—and legal implications of acquiring the most desirable sites."



The district's method of grade grouping affected site location. "We kept in mind desirable distances of travel for children of varying ages," says Smith. "Accessibility of sites is important, but there also are services such as utilities, sewerage, fire protection and transportation to consider."

The board checked on site standards with the State Department of Education and gots its approval before buying land decided upon.

• **Preliminary plans**—After sites were purchased, Anderson developed preliminary plans in consultation with educational authorities. During this period, he also looked into local building codes, studied site reports and correlated designing done by associates in other branches of engineering.

Preliminary drawings gave board members a chance to picture—for the first time—the solution to their plant problem. And a brief outline of specifications allowed them to get tentative cost estimates from local contractors.

Arranging the Financing

The board now asked: How can we pay the bill? Until now it had only come up against minor costs—mainly in connection with professional fees. But soon money had to be available for monthly contractor's bills.

Early in the planning stage, machinery for raising necessary funds went into action. The first step was to see what could be collected from the prime revenue source—the local district.

The Oakwood Park district obtains its money for school buildings and sites in four ways: bonds, tax on assessed valuation of district property, transfer of surplus money from general to schoolhouse funds; miscellaneous money in the schoolhouse fund (from gifts, insurance, property sales).

Like most school districts, Oakwood Park didn't have enough money in its capital fund to pay for the schools. Since pay-as-you-go was impossible, funds had to come from a bond issue and outside aid.

States vary widely in the support they provide and the way they provide it. "In our case," says Board Lawyer Lawson, "we first have to get State Board of Education approval for our long-range plan and proposed expenditure of local and state funds. Then we must secure the state board's approval of all plans and specifications for the two school projects on which state aid is necessary. After contractor's bids on the projects are on hand, we file application with the Division of Schoolhouse Planning for financial aid from the State School Construction Fund."

After the state board approves the application, its comptroller advises the local board as to proper procedure for drawing checks on state funds. "In our case," says Lawson, "regular school building grants are paid in equal annual installments. After the school building program is completed and approved by the state, the board receives the final 10% of the funds called for in the application."

• **Federal aid?**—What did the Oakwood Park board do about getting federal financial assistance?

Superintendent Smith: "Under Public Law 815 a small amount of funds is earmarked for school construction in federally affected areas—that is, in areas where federal defense plants or military installations increase the school-age population. But grants only are approved for a local education agency if there's a need to provide minimum school facilities for children of the federal workers. And our district has no such problem."

The U. S. Commissioner of Education determines eligibility of applicants for assistance, amount of maximum grants, priority status, amount and manner of payments. He works through state departments of education and receives advice and recommendations from state officials.

Districts can submit applications

and count the increase in federally connected children until June, 1956. But no payment is made to any local board unless the application is submitted to the Commissioner through the approved state agency.

After the project is approved by the Commissioner and funds reserved, payments are made as construction progresses. The Housing and Home Finance Agency—through its Commissioner of Community Facilities and Special Operations—carries out construction and engineering functions on federally aided projects. These include examination of final plans and specifications, and inspection and review of construction progress.

Details on district entitlements, state by state, may be obtained from tables included in the fourth annual report of the U. S. Office of Education, "The Administration of Public Laws 874 and 815."

• **How to issue bonds**—Since it was necessary to bond the Oakwood Park district, a municipal bonding attorney was hired to supervise preparations. "We wanted to conform to all technicalities," says Board President Baker. "Our own attorney is not a bond specialist and most prospective bond buyers require approval from a legal specialist known to them. The State Department of Education—or the building architect—usually can furnish names of a qualified bond attorney."

In addition, investment houses offered the board specialized aid in ways to study the district's present bonded indebtedness, future interest, payments needed to retire present bonds, amount of borrowing power left.

Bond Attorney Martin: "Our state has numerous restrictions on bond financing. We have to have a two-thirds approval by voters. We can only use serial type bonds. Bonds can't run more than 25 years. The maximum rate of annual interest is 5%. Bonds have to be sold by public marketing. Denominations of bonds have to be not less than $100 or more than $1,000. In addition, the Municipal Finance Commission and the State Board of Education has to approve the issue."

Selling the Plan

With a bond issue ahead, the board had another hurdle to jump: How to sell the school plan to the community.

"It's not enough to have a good plan," emphasizes Superintendent Smith. "Most citizens measure building plans in terms of taxes. What a school building program needs is a good job of public relations to make the plan understood by those who must foot the bill."

Smith feels that the community should be informed from the start of the survey. "If they're kept in the dark about the master plan, it's the starting point for possible future trouble when one of the projects calls for a bond issue or hike in tax rates. And a superficial, high-pressure publicity campaign usually comes too late."

"Timing," adds Superintendent Smith, "is also an important element in the success of a special campaign for a particular building program. For if the campaign drags out, voters become exhausted. The climax can be reached before election day."

Smith points to a successful six-week campaign staged by Glens Falls, N. Y., prior to voting for a bond issue. First week: Re-announcement of new building needs based on a survey. Second week: Revelation of conditions in the present set up. Third week: Description of the new building. Fourth week: Explanation of cost to the taxpayer. Fifth week: Information on who can vote—where, when and how. Sixth week: A recap of all points.

The basic campaign document of the Oakwood Park school board was a

brochure. Sent to all registered voters, it gave all the facts on the situation in the district, conditions to be improved, new construction to be done, cost to the average home owner, election data, voting qualifications.

• **Get to the voter**—"Our organized working committee used every possible media to broadcast facts to the voting public," says Board President Baker. "And since word-of-mouth is the most powerful persuader, the committee telephoned voters—and made a house-to-house canvass. Then there were news letters, spot announcements on the radio, bus displays, window and counter displays, windshield stickers, bulletin board posters."

Speakers – community representatives as well as board members and teachers—were furnished for as many civic organizations as possible. Once organizations understood the facts they helped put the campaign across.

"Newspapers were another source we tapped," says Baker. "We provided editors with interviews by prominent citizens and city officials. We provided plans and drawings of the new buildings for illustration. We also got advertisers to carry the campaign slogan in their ads. Sponsors—business and individuals—gave us free ads."

One of the most important steps in the campaign was getting out the vote. —and especially a vote favorable to the schools. The board brought mailing lists up-to-date by transcribing names from tax rolls in the city hall. It kept them up-to-date by periodic checks with the assessor and the water company. It saw that new residents registered to vote as soon as they were eligible.

Oakwood Park's special election brought a successful vote, and the board gave the architect the signal to go ahead with preparation of working drawings and specifications. During this period the superintendent and educational authorities had numerous conferences with Anderson to settle problems such as choice of materials. They also prepared the complete project budget with final cost estimates.

Choosing the Contractor

Any reputable building contractor who could furnish required bid bonds was entitled to bid on the projects.

One of Architect Anderson's duties during bidding was to see that public bid ads appeared in the local paper at least once a week for two weeks. To get keener competition, he also put notices in trade publications and sent letters to contractors he believed might be interested.

"In calling for bids there are several points to keep in mind," says Anderson. "Try to advertise when building activity is at low ebb and contractors are eager for work. In late fall or winter or early spring many builders are out of work. It is then early enough in the year to get the building under roof so work may proceed without interruption—and so that excessive expense for heating the following winter will be avoided. Also, advertise for a sufficient period—no less than three or four weeks—to enable builders to get dependable bids from sub-contractors and suppliers. And advertise at a time when bids are not being received for other important projects."

The contract was awarded on the basis of the amount bid, plus the contractor's reputation and ability. "We accepted the low bidder," says Superintendent Smith. "If the lowest bidder had exceeded the cost estimate or sum budgeted for the projects, we could have rejected them all. Or we could have accepted the lowest bid and arranged with the contractor to strip enough work from the buildings to bring down cost. We also could have required the architect to revise plans and re-issue them for bids."

Before announcing its choice, the board—with its architect—investigated qualifications (performance and financial records) of the low bidder and his sub-bidders.

When this was done the contractor furnished adequate protection for the school district through surety bonds from a responsible surety company. The board checked to see that the surety company was not undertaking a liability beyond its means to fulfill.

Checking on Construction

How to check on construction was the next point that bothered the board.

During construction Anderson was expected to handle cost accounting and progress reports as well as to make a periodic inspection of work. Inspection, under his contract with the board, covered visits to the job site to check general conduct of the work and to clarify any points regarding interpretation of drawings and documents. "My regular job visits," says Anderson, "varied from one week to ten days. They didn't in any way duplicate day-to-day inspection of the building inspector."

The building inspector, a necessity under the state's law, provided continuous inspection of all construction. He was selected by the board from a list of candidates acceptable to the state and the architect. His salary was determined and paid by the board. In addition to the usual qualifications of a building inspector, he had actual field experience in construction.

Structural, illumination, heating, plumbing and accoustical engineers—all associated with Anderson—supervised their special spheres of engineering. And since the State Department of Education contained an architectural department, it also rendered supervisory services during construction.

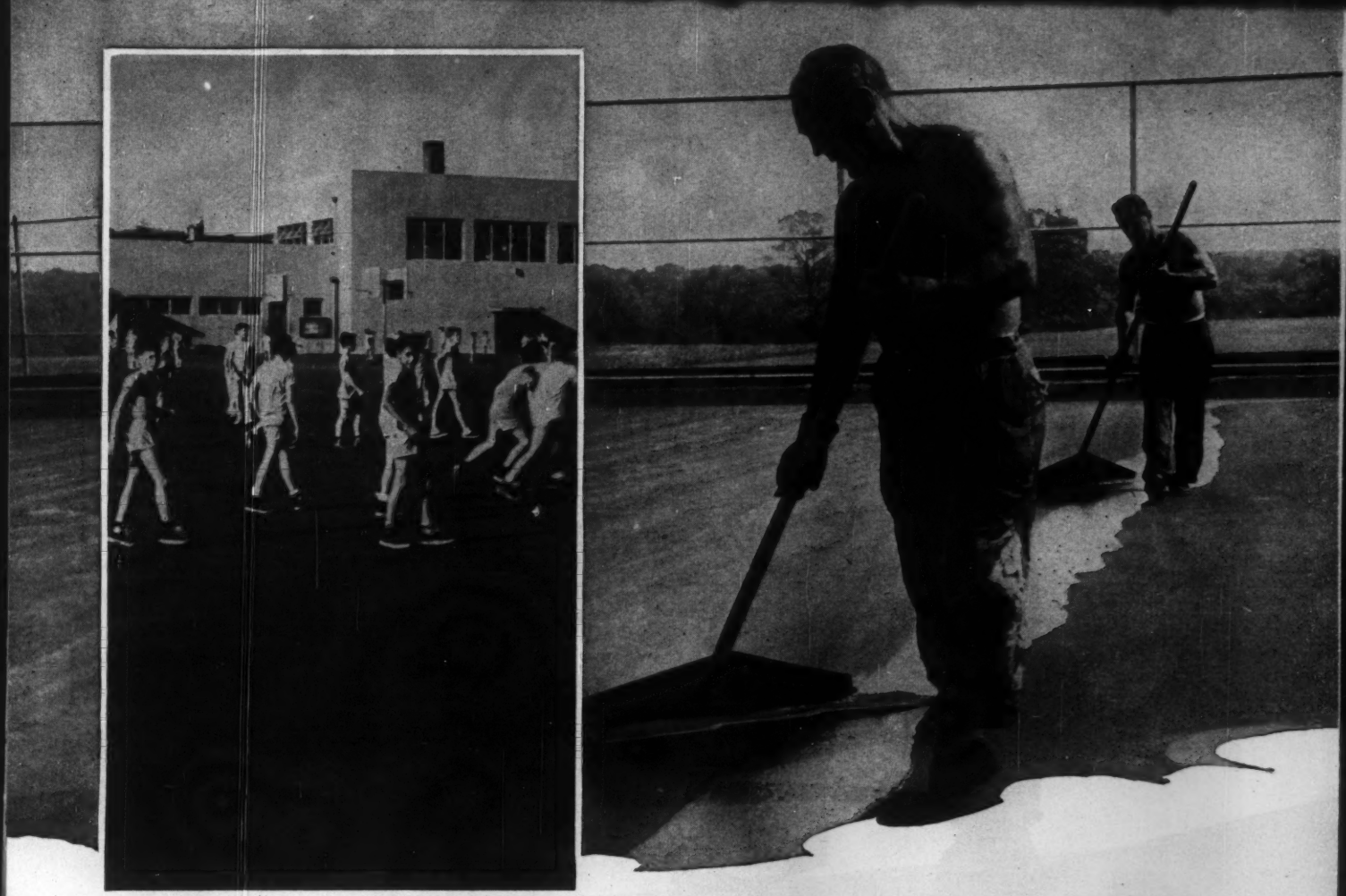
The state also required that laboratory tests of certain building materials (structural and reinforcing steel and concrete) be made during construction. This was to protect the board—and contractors—against use of any faulty building material. Reports prepared by the testing laboratory went to the state for its information.

"We relied on our architect to select the laboratory," says Board President Baker, "but the fees and any other expense in connection with tests were paid by the school district."

• **Role of the state**—State school officials can be an important source of helpful advice during design and construction. But functions—and legal machinery—of school plant sections of state educational agencies vary. Only 24 states require state review and approval of plans. And only 10 states have authority to supervise school building.

Primary supervision in many states lies in health, safety, reasonable economy and educational adequacy. There, state health authorities are required to approve water supply design, sewage disposal and food handling facilities. And state fire marshals have to approve plans for fire and panic safety.

The Oakwood Park story has hit only a few highlights of the problems a school board faces in conducting a building program. A more detailed discussion can be found in "You Want to Build a School?" by Charles Wesley Bursch and John Lyon Reid; "Guide For Planning School Plants," published by the National Council on Schoolhouse Construction; "What To Do About Old School Buildings," and "Economics From A to Z in Planning and Building Schools," put out by the State of New York Commission on School Buildings; "How To Choose a School Site," and "Conducting A School Building Program," by the New England School Development Council. Additional helpful material can be found in working guides put out by the National Citizens Commission for the Public Schools and in booklets by the various state boards of education.



Los Angeles Board of Education selects WALK-TOP for sealing 4,500,000 sq. ft. of playground

THE Board of Education, City of Los Angeles, with one of the nation's largest school populations, has just completed the first phase of a highly progressive program. Over 4,570,000 sq. ft. of playground area in that city have been surfaced and sealed with resilient, non-abrasive materials.

Objectives are Four-fold:

1. To reduce the danger of playground accidents.
2. To minimize wear on clothing and equipment.
3. To reduce expenses of building maintenance.
4. Increase life of playground.

On the basis of competitive tests covering 70,000 sq. ft., Walk-Top was selected for use on the remaining 4,500,000 sq. ft. The cost was well under 4c per sq. ft.

A Nationwide Trend

The benefits of play area resurfacing are now recognized by school boards throughout the nation. School executives in your own area will welcome an opportunity to discuss their problems with you. For full particulars contact the Laykold Engineer nearest you.

Walk-Top is one of the nationally famous Laykold® products for playgrounds and tennis courts.

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Spray 32 Feet

Now

Schools: New Long-Span Q-Deck greatly simplifies the design of covered walkways and cantilevered canopies in modern schools, as well as allowing corridors to be included in the same span with classrooms.

Supermarkets: As in the case of schools, much greater latitude of design is allowed by increasing deck span. Considerable saving in structural steel is made possible, and time and labor are cut down in the erection of the deck.

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with Robertson Long-Span Q-Deck

After considerable testing and research, H. H. Robertson Company is pleased to announce the availability of a new product much needed in modern lightweight construction—a deck which will span greater distances without loss of load-carrying capacity. New Long-Span Q-Deck, now being manufactured in quantity for the first time, carries with it all the basic quality and advantages of Robertson's famous Standard Q-Deck. Side laps become standing seams and are mechanically fastened at regular intervals for structural stability. Units are easy to handle and erect with a minimum crew. They install quickly and tightly because of precision manufacture. Long-Span Q-Deck is best adapted for use in schools, supermarkets and other building types where longer single spans indicate positive economies. Use the coupon to write for literature concerning this new Robertson product.

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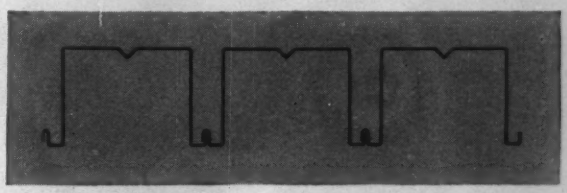

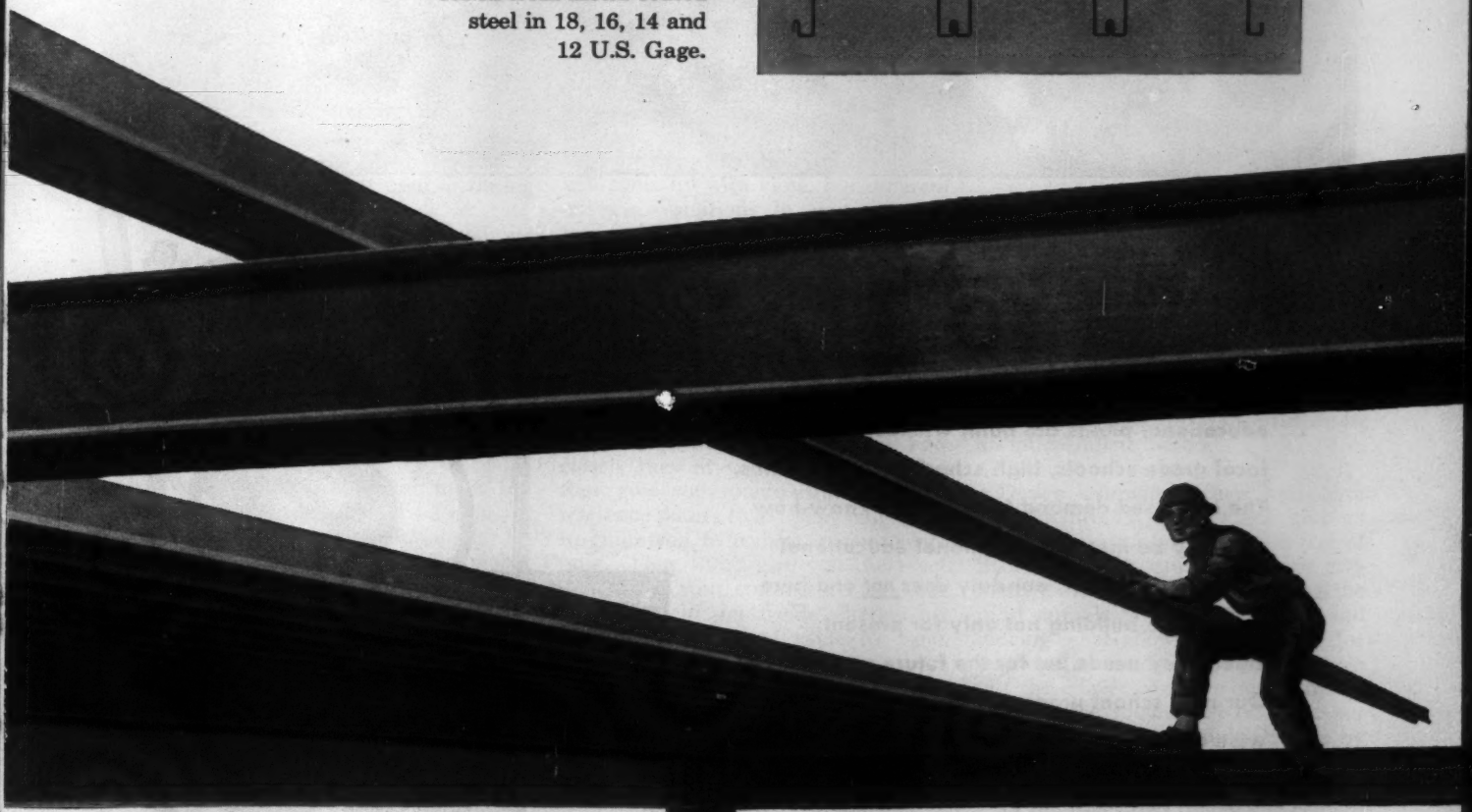

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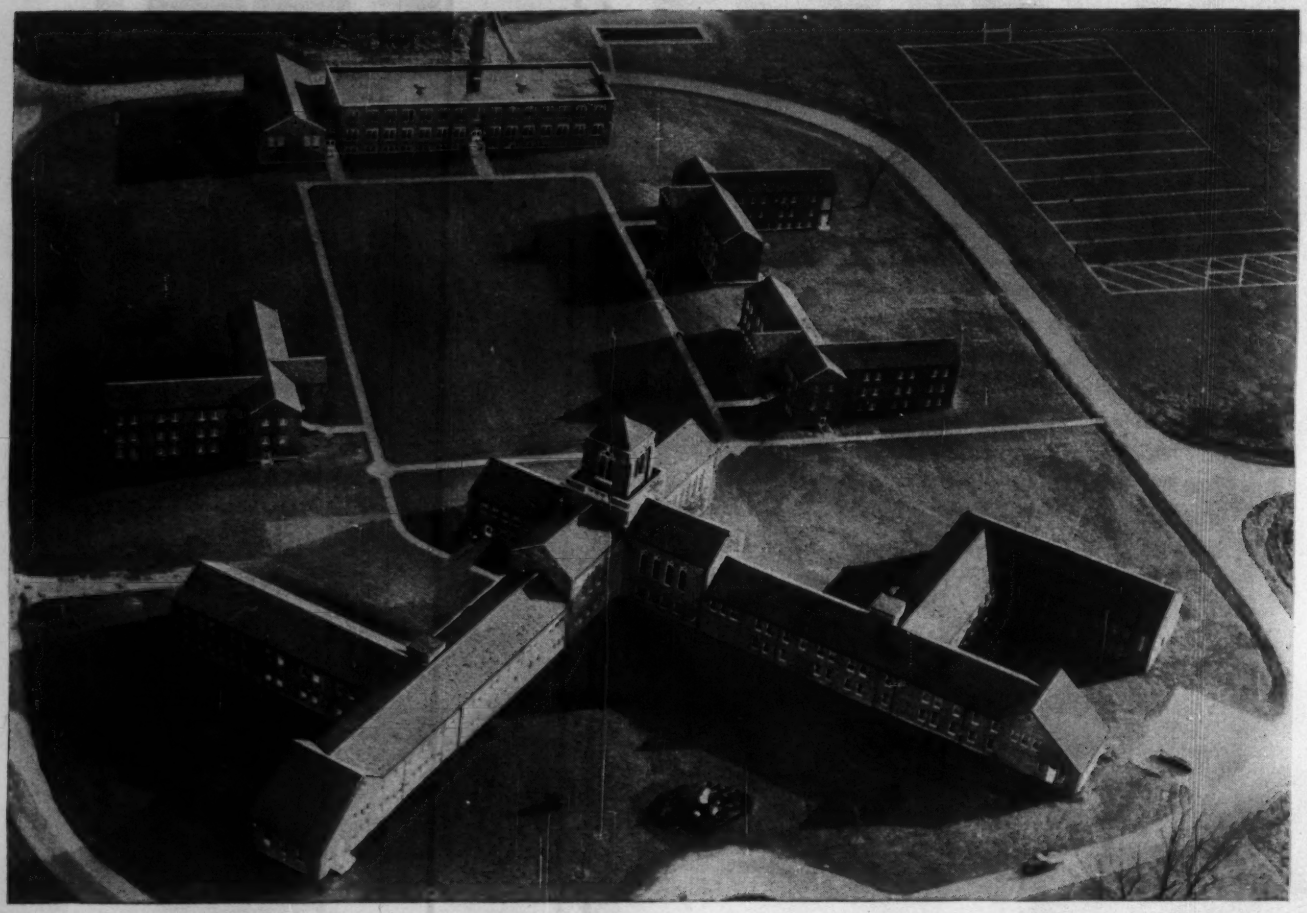

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It is *everyone's* duty to see that adequate educational plants are built, whether they are local grade schools, high schools or universities. The increased demand for technical know-how can only be met with additional educational facilities. However, our duty *does not* end here . . . we are building not only for present emergency needs but for the future as well. Our new school program *must not* be "penny wise and pound foolish" . . . build *your* schools and universities to LAST!

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How Much Should Your School Cost?

Test patterns in the pages that follow are set up to guide you in estimating what your school should cost. You will find one "plush" job at $29.20 per square foot and a temporary austerity model at $7.52. But mostly these test patterns are middle of the way prices flanked in some cases by reasonable minimums and maximums.

The big thing to keep in mind is that prices and costs are always on the move, that they are influenced by every move you make. To get a cost estimate for a specific school at a specified time requires that you stop the motion, in effect select just one frame out of this moving picture. Your results depend on the judgment used in timing and in diagnosing your needs.

Some of the pitfalls to avoid are noted—why a high cost per square foot can produce a low cost per pupil. Or how a low cost per square foot can be a tip-off on wasteful use of space if it results in a high cost per pupil without providing extra benefits in special training facilities.

Big Schools Lower Unit Costs

Why small schools cost more per pupil is explained, also why secondary schools should not be too small. To keep cost per pupil within reasonable bounds you need lots of pupils to absorb or spread the unit cost of the special-purpose and group-activity space that is required for adequate training facilities for the older children.

You will need cost estimates at three different stages in your school planning:

1. Your preliminary budget estimate, before your school is designed, before you know how big it will be.
2. Your design estimate for judging whether it is on the plush or on the austerity side. At this stage you know how many square feet of floor space your plans provide.
3. Your construction contract estimate—the final test of your planning.

The contractor's estimate is the most precise of these three. It is tailored to your site conditions, local prices and wages. He itemizes the tons of steel called for in the plans and figures the cost of buying, erecting and painting it. He calculates how many barrels of cement, cubic yards of concrete, squares of roofing, square feet of plywood, thousands of board feet of lumber. He counts the bricks and blocks, the windows and doors. Even so, two or more equally competent contractors, figuring from the same set of plans for work at the same location, under identical conditions except for the methods they plan to use, will come up with close, but different answers, variations in unit costs as well as in the overall total. This is the precision type of estimating that produced most of the prices in the pages that follow.

Actual Prices and Averages

The prices shown are actual prices or price averages of existing schools, dated and defined so you can tell how closely they fit your conditions. But they give you rough estimates only, reference points to aid your judgment, to guide you to realism in your planning. They won't give you the exact amount of your contractor's bid, but they will help you decide whether his price gives you good value for your investment.

The timing curves will help you judge your market so you can call for bids when lively competition for your job is assured. Or you can adjust costs prevailing in other years to adapt them to present conditions.

• **First budget estimate**—You usually need a cost estimate before you know the size of your school, before it is designed or even planned in detail. But you do know how many pupils you plan to house and train, possibly the number of classrooms you will need. In this case the most practical basis for estimating is the unit of capacity, the pupil, the pupil station, the classroom.

Tables and curves in the pages that follow give you the number of square feet to multiply by the number of pupils to get a rough idea of the size of school you will need. Other tables give you the number of square feet to multiply by the number of classrooms to get a total for the school. Now you can apply the most suitable price per square foot from the following tables to the total square feet to get your budget estimate.

Independent Cross Check

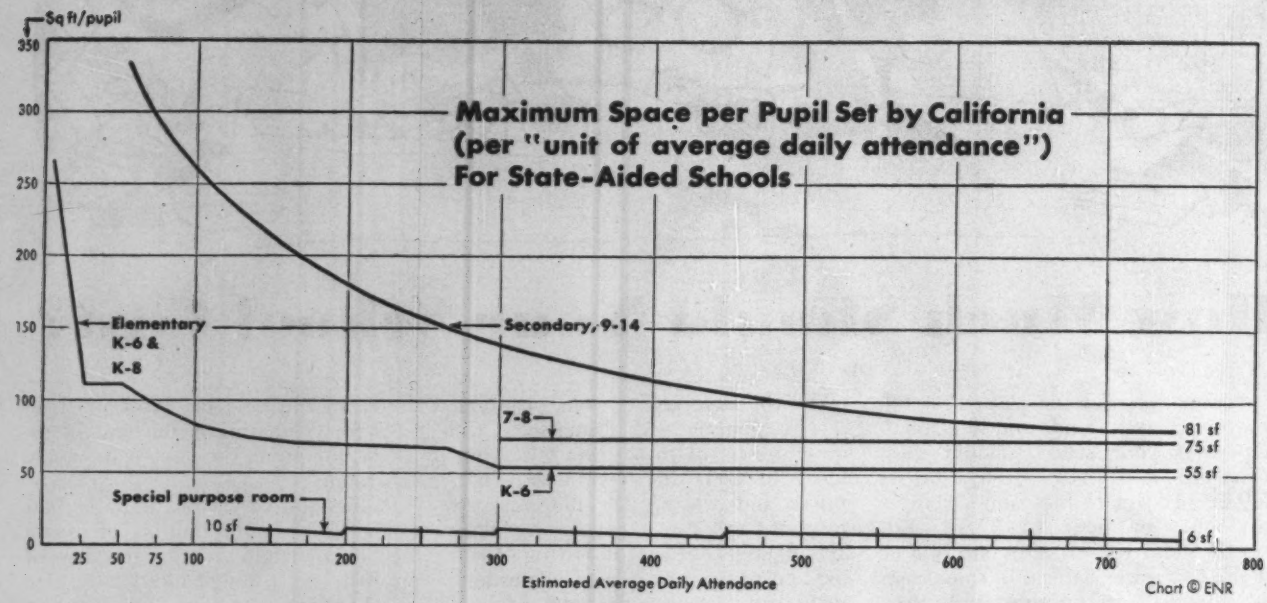
Possibly you would like to get a cross check on this. You can use a block method. You will find a table showing space needed for regular classrooms, for special classrooms, for administration, for group activities, for storage. You will also find a table showing how costs per square foot of these differing-purpose areas can be expected to vary and you can build up your estimate by an independent method.

• **Design estimate**—When you have your architect's plans, which give an accurate measure of the square feet of floor space, you can get a closer estimate of the total cost by applying the most suitable cost per square foot and judging what allowances to make for your special conditions. You can also test the efficiency of the design by examining the square feet of space per pupil. And you can multiply this by the cost per square foot to get cost per pupil.

In the pages that follow you can see how much more a fire-resistant building costs to construct than a combustible building.

You can also find out whether you are in a high- or low-cost zone, and whether you can afford several special-purpose areas or must stick to minimum facilities.

How to Estimate Size and Cost of Schools . . .



This Space is Provided for Handicapped Children

Type of Handicap	Size of Class (No of pupils) By Number of Rooms: Minimum 1	2	3	Maximum 1	2	3	4+	Maximum Area per Classroom: K–8 sq ft each*	7–9 sq ft each*	9–12 sq ft each*
Mentally retarded, Partially seeing, Hard of hearing	12	24	42	18	36	54	X18	1373	1635	1680
Deaf	6	12	21	10	20	30	X 8	1235	1335	1360
Blind	8	16	27	12	24	36	X10	1290	1410	1440
Severely mentally retarded	7	14	25	12	24	36	X10	1290	....	....

* For additional classrooms multiply these areas by number of classrooms to get total areas X—multiply by

Data from Departments of Finance and Education, State of California

To see the impact that space per pupil has on school costs, just multiply the square feet of floor space per pupil by the cost per square foot of the school.

This is the cost per pupil and is the capacity unit cost. High costs here can mean high standards and generous facilities. They can also mean loose planning and waste space. Good cost sleuthing should determine which before adopting a school plan.

In two almost identical schools, for example, the high square-foot cost produces the low per-student cost. Figures cited by the Legislative Auditor in the California Senate Record illustrate that square-foot costs alone do not measure the efficiency of the design or plan, but can, in fact, mislead in judging it.

Unit costs, similar schools	School A	School B
Number of pupils	485	485
Cost per square foot	$10.85	$11.62
Square feet per pupil	52.2	47.6
Cost per pupil	$567	$555
Date under contract	3–27–53	4–9–53
Differences	more walks and arcades	more compact

Both: 11 classrooms, 2 kindergartens, 1 multi-purpose room

It is self-evident that the more compact the plan, the lower the total square feet of floor area and the higher the square-foot cost.

Since California limits the space per pupil on state-aided schools and in addition, limits the cost per square foot, this, in effect, limits the cost per pupil. Furthermore, state-aided school costs may not exceed the cost of comparable new construction in the same area by non-aided school districts. This means that the space and cost maximums shown in these pages for California are close to minimums for non-aided schools.

Climate may aid California in these low space-per-student provisions since the need for sheltered play and lunch space is less compulsory than in colder, wetter areas. For example, the California state-aid maximum space in elementary schools of 300-pupil capacity or larger is 55 sq ft per pupil. This compares with 84 sq ft in a 300-pupil school and with 61 sq ft in an 800-pupil school with one large general activities room in New York State. Corresponding space range in New York for schools with two large-unit rooms is 98 and 86 sq ft and with three large-unit rooms, 120 and 103 sq ft per pupil.

"Space-per-pupil" is used loosely here for California, whose unit of capacity is "average daily attendance".

Los Angeles Tests Less Space per Pupil In Temporary Schools

Permanent Schools (1953)

Elementary	No. of Pupils	$/Sq Ft	Sq Ft per Pupil	$/Pupil
156 Street	555	$11.93	46	$548
Newcastle	555	11.05	49	540
Valley View	345	14.85[a]	54	790
Average in LA		14.00	50[b]	760

[a] Difficult site, caisson foundations, unitized buildings not practical

[b] Includes covered arcades and multi-purpose buildings

Site and grounds development are normally 10% of cost of Building Construction

Temporary Schools (1952)

Elementary	No. of Pupils	$/Sq Ft	Sq Ft per Pupil	$/Pupil
Dolores Street	900	$7.85	29.4	$230.00
Average 392 units	...	7.52	29–31	211.53
Average 12 plants	...	8.00	...	250.00
Average for	450	.....	31.0	.....

35 pupils per class, 50 pupils per kindergarten. No architect services, only contract construction, no multi-purpose room, no library, no covered arcades, no storage space. Mobile-unit-feeding from central kitchen. Lunch outdoors or in classrooms.

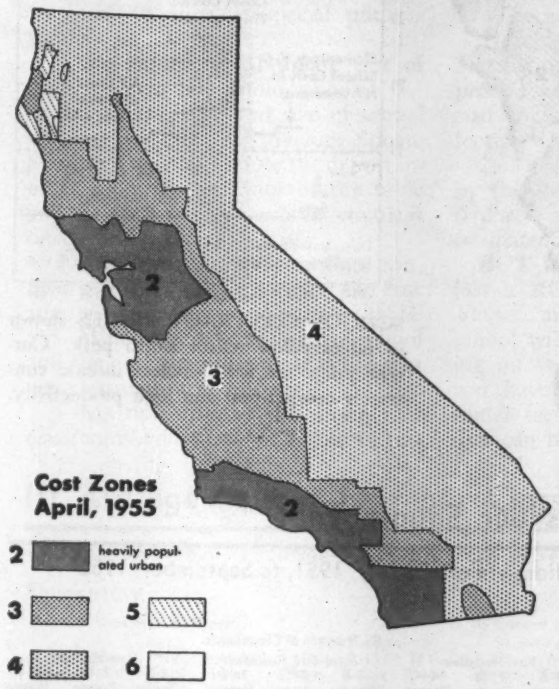
No plumbing in classroom building, all centered in Sanitary Building.

Temporary, two classrooms per building, schools standard design, wood frame, plywood, stucco construction, thermal insulation, acoustical ceilings, wood mudsill foundations, cost 20% less per square foot, 40% less per pupil than for permanent schools.

This is estimated by determining the enrollment of each grade and multiplying this by 0.97. Then, this figure is projected to allow for larger enrollments in lower grades than will advance to the grade under study. It is also corrected for new family dwellings under construction in the district and not yet occupied.

Space needed per pupil goes up very sharply in the smaller schools, where the "production" classrooms have to absorb the "overhead" of administration, group activity and other non-instruction space.

. . . By Per-Pupil and Use-Block Methods



BUILT-UP ZONES near metropolitan centers, where larger schools prevail, show lower cost per square foot.

California Sets These Maximum Costs For State-Aided Schools—By Use Areas

Effective April, 1955 (reviewed quarterly) $ per sq ft—By Cost Zone (see map)

By Area Use	*1	2	3	4	5	6	*7
Administration Offices	$13.05	$13.78	$14.50	$15.22	$15.95	$16.68	$17.40
Arts, Crafts, and Music Rooms	13.05	13.78	14.50	15.22	15.95	16.68	17.40
Classrooms and Closed Corridors	12.15	12.82	13.50	14.18	14.85	15.52	16.20
Domestic Science Rooms	16.20	17.10	18.00	18.90	19.80	20.70	21.60
Gymnasiums—High School	13.50	14.25	15.00	15.75	16.50	17.25	18.00
Kindergarten Rooms (Includes Toilet)	13.50	14.25	15.00	15.75	16.50	17.25	18.00
Kitchens	19.80	20.90	22.00	23.10	24.20	25.30	26.40
Locker–Shower Rooms (Without Lockers)	16.20	17.10	18.00	18.90	19.80	20.70	21.60
Locker–Shower Rooms (With Lockers)	18.00	19.00	20.00	21.00	22.00	23.00	24.00
Mechanical Rooms, Storage, Janitor Rooms	11.25	11.88	12.50	13.12	13.75	14.38	15.00
Multipurpose Rooms (Without Tables)	15.30	16.15	17.00	17.85	18.70	19.55	20.40
Multipurpose Rooms (With In–wall Tables)	16.20	17.10	18.00	18.90	19.80	20.70	21.60
Science Rooms—Elementary	14.85	15.68	16.50	17.32	18.15	18.98	19.80
Science Rooms—High School	16.20	17.10	18.00	18.90	19.80	20.70	21.60
Sheltered Areas, Open Corridors	4.50	4.75	5.00	5.25	5.50	5.75	6.00
Shops—Elementary (Without Equipment)	10.35	10.92	11.50	12.08	12.65	13.22	13.80
Shops—Elementary (With Equipment)	13.05	13.78	14.50	15.22	15.95	16.68	17.40
Shops—High School (Without Equipment)	14.85	15.68	16.50	17.32	18.15	18.98	19.80
Shops—High School (With Equipment)	16.20	17.10	18.00	18.90	19.80	20.70	21.60
Toilet Rooms	19.80	20.90	22.00	23.10	24.20	25.30	26.40
Other Facilities Not Listed Above	12.15	12.82	13.50	14.18	14.85	15.52	16.20
Average for whole school	no such average set by state						

* Available if needed. Zones 1 & 7 not now in use (Some mountain areas might rate Zone 7 if they applied for aid.

THESE COSTS apply to schools of 10,000 sq ft or more. For schools of 5,000–9,999 sq ft of building area add 5% to amount shown. For those of less than 5,000 sq ft add 10%.

NOT INCLUDED in these costs are: land purchase, site development, furniture#, ("Don't" List—see below for details).

(# State allows 5% of construction costs to be applied to site development excluding utility services.

School districts can obtain all essential furniture consistent with the "Don't" List—this averages $800 per classroom.

CLASSROOM space runs from 50–60% of total building area.

Data from Departments of Finance and Education, State of California.

No maximum average costs are set by California on its state-aided schools. Instead, a building block system of building cost estimates limits the cost of each use-area as shown in the table.

Thus, in Cost Zone 2, for example, classrooms can cost no more than $12.82 per sq ft, while kitchens can go as high as $20.90.

Such focused costs are unusual. They permit close examination of the effect of adding service features to a school. They aid also in diagnosing how much special-purpose space adds to the overall cost of the school.

These are maximum costs allowed under state-aid, but tend to minimum for non-aided schools, since the law requires that aided schools cannot cost more than comparable non-aided. They exclude the items on the accompanying "DON'T" List.

Classrooms account for 50% to 60% of the space in aided schools.

Classes of 35 at 60% of 55 sq ft per pupil would indicate 1,150 sq ft per classroom. In kindergartens with 50 pupils, the size would be 1,650 sq ft.

The best summary to date of space assignments in existing schools is the accompanying table abstracted from the Engelhardt, Engelhardt and Leggett report on 20 schools. This should be useful in applying the costs above to a built-up cost estimate based on facilities planned for your school.

"DON'T" List—Not Eligible for State Aid

Plant boxes or indoor planting areas
Built-in reversible easel boards
Built-in project screens
Broadcasting systems, televisions, recorders, public address systems, or other intercommunicating devices, except telephones. (The necessary conduit for these may be installed)

Flood lights in yard or parking areas (except lights attached to buildings for safety and protection purposes)
Ranges, refrigerators, food mixers, potato peelers, or other nonbuilt-in kitchen equipment
Stainless steel or monel metal in kitchens (except for working surfaces and sinks)
Special masonry units which are not stock items as to size, texture, etc., or are not generally manufactured
Tiled or over-ornamental flagpole bases, masonry fences or walls, bird baths, wading pools, aquariums, ornamental retaining walls, decorative clocks, neon signs, etc., on exterior of building; built-in benches in entries, foyers, or lobbies

Useless architectural ornaments or forms which are not related to the function of the building or plan
Plaques of any kind
Cabinet work, including wardrobes, shelving, or cupboards in excess of 36 lineal feet for regular classrooms
Spring floors or hardwood finish floors over concrete slabs in multi-purpose rooms
Adjustable stages or platforms operated mechanically in multipurpose rooms

All stage or platform curtains, drapes, cycloramas, or banks of colored lights in multi-purpose rooms
Inside athletic or playground equipment in multi-purpose rooms
Separate toilets in or directly attached to classrooms above the first grade
Display cases in an elementary school which are in excess of 5 lineal feet
Display cases in a high school, junior high school, or 7–8 grade departmentalized school which are in excess of a total of 5 lineal feet or in excess of 0.02 of a lineal foot for each pupil assigned to the school in the district application, whichever is greater

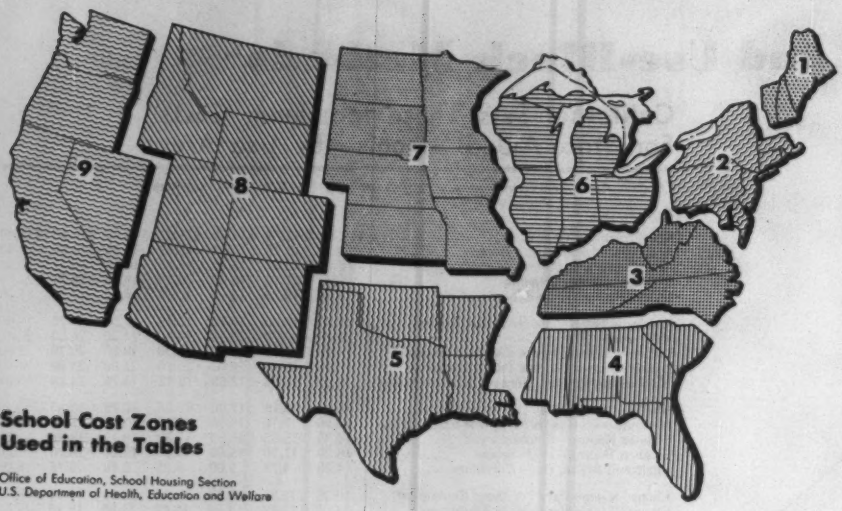
Tempered full-length glass doors
Fireplaces
Development of outdoor classrooms (Cost of any pavement of outdoor classrooms is to be a part of the site development budget)
Lawn sprinkler systems
Water well installations to reduce fire hazards beyond requirement of State Fire Marshal

Elementary School Space Needs—By Purpose

Study of 20 schools by Engelhardt, Engelhardt and Leggett, Educational Consultants, N. Y.

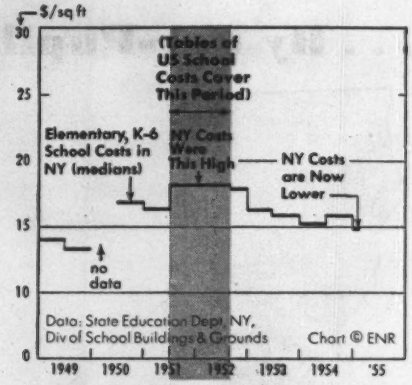
(1950)	No. of Schools	Space Used—in Sq Ft Small	Medium	Large
Instruction Rooms				
Classrooms, General*	20	660	888	1,350
Primary	..	660	925	1,200
Intermediate	..	660	805	1,200
Kindergarten	14	960	•1,150	1,980
Art	8	400	800	2,000
Home Economics	3	1,200	.....	2,338
Industrial Arts	4	1,000	1,500	3,300
Library	11	700	1,350	2,050
Library Work Room	11	60	170	336
Music	6	660	710	1,350
Science	2	700	.....	1,100
Handicapped (Sight Conservation—Mentally Retarded)	2	805	.....	880
Group Activity Rooms				
Auditorium	10	1,500	3,000	4,080
Auditorium Stage	14	670	935	1,920
Assembly-Playroom	4	1,350	.....	7,000
-Stage	..	400	500	880
Gymnasium	9	1,700	2,880	6,700
Shower-dressing Room	6	175	350	1,000
Cafeteria	10	1,700	2,700	4,900
Playroom-Cafeteria	1	.....	2,400	.....
Assembly-Cafeteria	2	3,200	.....	♭3,575
Kitchen	16	756	1,100	2,400
Administration Space				
Principal's Office	19	100	180	340
General Office	19	120	300	800
Physical Education Office	7	100	180	320
Health Suite	19	200	350	800
Teacher's Rooms	18	150	290	430
Lunch Rooms	3	150	275	500
Custodian's Room	12	60	.....	750
Storage Facilities				
Principal's Office	7	20	63	170
Gymnasium	12	50	130	350
Stage	7	75	125	300
Custodian's	6	35	130	200
Kitchen	11	50	120	360

NOTES: Instruction Room space shown includes individual toilet rooms, coat storage space, and workrooms when these are part of the classroom suite.
* 30 pupils per class assumed.
• Includes toilets and auxiliary space.
♭ Includes 660 sq ft of storage space.



School Cost Zones Used in the Tables

Office of Education, School Housing Section
U.S. Department of Health, Education and Welfare



SCHOOL CONTRACT PRICES shown in tables below reflect Korea peak. Current prices are lower—reflect intense contractor competition and high productivity.

I Where School $ Goes

By Type

Elementary

Cost Zone	To General Construction: Fire Resist ¢	Semi-Fire Res ¢	Combustible ¢	To Heating & Ventilation: Fire Resist ¢	Semi-Fire Res ¢	Combustible ¢
1	78.56	74.53	74.83	11.39	13.89	14.53
2	75.64	73.13	74.97	11.16	12.01	11.72
3	76.35	77.58	79.40	10.64	9.26	8.99
4	78.39	79.98	.....	8.39	7.77	.....
5	79.85	79.87	79.93	8.27	7.03	7.76
6	74.44	73.77	63.85	11.09	12.45	24.53
7	77.11	76.91	75.34	10.70	10.08	13.74
8	76.10	77.19	70.68	11.15	10.65	13.19
9	76.53	74.66	73.07	8.60	8.70	10.59
All	75.87	74.77	73.85	10.89	10.42	11.20

Junior & Senior High

Cost Zone	To General Construction: Fire Resist ¢	Semi-Fire Res ¢	Combustible ¢	To Heating & Ventilation: Fire Resist ¢	Semi-Fire Res ¢	Combustible ¢
1	.....	.....	.....	.....	.....	.....
2	75.03	72.37	.....	10.91	12.23	.....
3	78.64	78.49	.....	9.68	8.58	.....
4	75.38	75.47	.....	9.90	11.55	.....
5	77.54	83.24	.....	9.52	5.79	.....
6	73.78	72.47	.....	11.21	12.96	.....
7	78.29	80.00	.....	10.34	8.00	.....
8	77.93	75.27	.....	9.27	11.33	.....
9	77.42	74.37	.....	8.08	9.55	.....
All	75.91	74.67	.....	10.33	10.67	.....

Elementary

Cost Zone	To Plumbing: Fire Resist ¢	Semi-Fire Res ¢	Combustible ¢	To Electric Service: Fire Resist ¢	Semi-Fire Res ¢	Combustible ¢
1	5.93	6.59	5.96	4.12	4.98	4.98
2	6.38	7.59	6.80	6.82	7.27	6.51
3	7.09	7.70	5.29	5.92	5.46	6.32
4	6.43	6.08	....	6.79	6.17	....
5	5.95	7.21	7.42	5.93	5.89	4.88
6	7.68	8.34	5.88	6.79	6.44	5.74
7	6.99	7.47	5.84	5.20	5.44	5.08
8	6.69	6.56	8.01	6.06	5.60	8.11
9	7.50	8.71	8.92	7.37	7.93	7.42
All	6.86	7.87	8.10	6.88	6.94	7.06

Junior & Senior High

Cost Zone	To Plumbing: Fire Resist ¢	Semi-Fire Res ¢	Combustible ¢	To Electric Service: Fire Resist ¢	Semi-Fire Res ¢	Combustible ¢
1	....	....	....	....	....	....
2	6.08	6.92	....	7.98	8.46	....
3	5.56	6.98	....	6.02	5.92	....
4	7.04	6.03	....	7.68	6.93	....
5	6.59	5.73	....	6.35	5.22	....
6	7.71	7.68	....	7.29	6.87	....
7	5.78	6.00	....	5.59	6.00	....
8	5.93	7.93	....	6.87	5.41	....
9	7.21	8.40	....	7.29	7.66	....
All	6.48	7.54	....	7.28	7.10	....

Based on samplings of pre-contract estimates. Extreme or unusual cases avoided. Some in-room toilet service is included in plumbing. In rural areas cost of disposal system is included with plumbing in some cases. Derived by authors from field data

II Cost of Schools per Square Foot

By Type, By Size, By Location—In effect July, 1951, to September, 1952

Elementary

Cost Zone	Average—All Types: Fire Resist	Semi-Fire Resist	Combustible	Fire Resistive: By Number of Classrooms: 1-6 Rooms	7-13 Rooms	14+ Rooms	Semi-Fire Resistive: 1-6 Rooms	7-13 Rooms	14+ Rooms	Combustible: 1-6 Rooms	7-13 Rooms	14+ Rooms
1	$12.22	$10.73	$9.74	$8.24	$14.12	$11.91	.....	$11.15	$10.54	.....	$7.43	$12.76
2	18.79	17.67	16.45	18.13	18.75	18.28	$16.21	18.07	18.05	$16.50	17.28	15.93
3	11.45	8.84	10.07	10.38	12.06	12.36	8.25	9.30	7.86	8.22	10.56	10.00
4	8.77	7.91	10.57	10.59	9.23	8.59	5.42	8.34	8.70	.....	.....	10.57
5	11.71	10.16	9.03	12.60	11.15	13.09	9.33	9.01	10.29	.....	8.83	9.22
6	15.71	13.63	9.00	14.43	17.26	15.60	13.00	14.18	14.20	.....	11.51	.....
7	13.59	11.70	10.34	13.06	14.12	14.72	13.09	11.34	10.56	.....	9.19	11.79
8	12.55	12.63	10.56	12.58	12.49	12.40	15.91	12.32	12.87	.....	10.79	10.52
9	16.65	13.61	14.80	14.83	17.91	14.48	16.12	14.20	13.81	14.82	13.98	13.82
All	$15.12	$14.02	$14.06	$13.93	$15.29	$14.66	$17.52	$13.03	$13.65	$14.57	$12.85	$12.38

Junior and Senior High

Cost Zone	Average—All Types: Fire Resist	Semi-Fire Resist	Combustible	Fire Resistive: By Number of Classrooms: 1-6 Rooms	7-13 Rooms	14+ Rooms	Semi-Fire Resistive: 1-6 Rooms	7-13 Rooms	14+ Rooms	Combustible: 1-6 Rooms	7-13 Rooms	14+ Rooms
1	$6.81	$11.21	$11.49	.....	$6.80	.....	.....	.....	$11.28	.....	.....	$11.49
2	17.58	16.31	14.63	.....	18.42	$17.20	.....	.....	16.32	.....	.....	14.63
3	11.36	9.85	8.44	$8.64	13.47	10.69	$9.26	$8.92	9.96	$5.77	$8.90	.....
4	9.24	9.03	.....	.....	7.66	9.65	.....	8.74	9.31	.....	.....	.....
5	11.77	9.81	7.90	10.39	10.22	10.84	6.66	9.24	8.54	6.36	8.11	9.78
6	15.89	13.48	.....	12.41	14.52	14.81	9.49	13.15	14.18	.....	.....	.....
7	13.76	10.66	.....	9.91	10.83	13.43	10.93	15.91	.....	.....	.....	.....
8	12.85	11.22	7.87	.....	10.99	11.15	11.93	11.82	12.33	6.64	9.07	.....
9	16.68	14.70	15.06	14.98	14.02	17.86	14.84	11.91	13.52	16.46	11.35	14.22
All	$14.58	$12.43	$13.56	$12.06	$12.45	$13.71	$10.68	$12.21	$12.33	$8.03	$10.07	$13.89

Elementary

Cost Zone	Single vs Multi-story Schools: Fire Resist 1-st	Fire Resist 2-st or more	Semi-Fire Resist 1-st	Semi-Fire Resist 2-st or more	Combustible 1-st	Combustible 2-st or more	Urban vs Non-Urban Schools: Fire Resistive Urban	Fire Resistive Non-Urban	Semi-Fire Resist Urban	Semi-Fire Resist Non-Urban	Combustible Urban	Combustible Non-Urban
1	$11.62	$13.09	$10.73	.....	$19.74	.....	$17.42	$10.83	$11.11	$10.48	.....	$7.43
2	17.85	19.66	17.31	$17.52	16.30	.....	19.35	16.57	17.46	15.85	$17.70	17.43
3	11.83	10.51	8.81	9.10	10.08	.....	13.46	11.19	8.13	8.90	10.93	9.54
4	8.83	8.54	7.93	.....	10.57	.....	9.24	8.97	8.89	7.87	10.57	.....
5	11.65	12.09	10.19	9.33	9.04	.....	12.21	11.26	11.53	9.57	9.78	8.13
6	15.43	16.28	13.63	13.72	11.51	.....	17.39	15.04	16.00	12.25	6.41	12.61
7	13.82	13.04	11.67	12.70	9.19	$11.79	15.35	13.35	12.40	11.18	9.88	10.56
8	12.65	12.01	12.49	17.48	10.90	8.57	13.28	12.17	12.72	10.98	10.31	10.80
9	15.04	19.98	15.33	14.83	14.81	.....	15.44	15.89	13.93	14.71	13.69	14.68
All	$14.14	$17.00	$13.91	$15.18	$14.11	$9.69	$15.91	$13.74	$13.48	$12.21	$12.34	$12.00

Junior and Senior High

Cost Zone	Single vs Multi-story Schools: Fire Resist 1-st	Fire Resist 2-st or more	Semi-Fire Resist 1-st	Semi-Fire Resist 2-st or more	Combustible 1-st	Combustible 2-st or more	Urban vs Non-Urban Schools: Fire Resistive Urban	Fire Resistive Non-Urban	Semi-Fire Resist Urban	Semi-Fire Resist Non-Urban	Combustible Urban	Combustible Non-Urban
1	.....	$6.81	$12.28	$10.18	$11.49	.....	.....	$6.81	$12.28	$10.18	.....	$11.49
2	$16.94	23.71	17.91	15.48	14.63	.....	$17.56	16.35	.....	16.32	.....	14.63
3	11.61	16.05	8.85	10.86	6.88	$11.76	13.94	7.18	9.69	9.86	$11.76	7.19
4	8.94	9.48	8.41	9.28	.....	.....	10.01	8.91	10.07	8.07	.....	.....
5	10.46	12.68	9.85	9.62	7.91	.....	12.47	9.60	11.35	9.96	.....	8.38
6	16.06	15.83	13.40	14.12	.....	.....	18.37	17.30	16.31	10.96	.....	.....
7	10.82	15.27	10.66	.....	.....	.....	15.66	11.91	.....	11.31	.....	.....
8	11.04	13.89	12.25	8.33	7.88	.....	12.09	11.52	12.80	12.15	.....	7.88
9	15.70	17.91	15.11	13.23	15.04	.....	16.96	12.44	14.96	12.57	14.40	14.75
All	$13.11	$17.64	$13.21	$11.32	$13.57	$11.76	$15.37	$12.91	$13.63	$11.83	$14.30	$11.78

Based on original cost estimates for new school buildings, made when applying for allotments of building materials. These were checked by follow-up on 98% of cases after buildings were erected or substantially completed. Comparable data were used, spot-checks indicated a fair degree of accuracy. Costs here exclude land, professional fees, furniture, and equipment which is not an integral part of the building, thus do not show total capital outlay for complete school plants. For estimating the total number of square feet of gross floor area in school building, see companion table III.

. . . Or Estimate by Per-Classroom Method

When you know how many classrooms you need (pupils per class range from 25 to 35 plus special purpose rooms) . . .

. . . To get the total square feet of floor space in the whole school:

1—Pick the type and size of school you want in table III, Average Square Feet per Classroom (note the definition of classroom at the foot of the table and be sure your classroom count is on the same basis)

2—Find the cost zone your state is in, from the map. This gives you the cost zone number and line to use in table.

3—Where the type and size of school and the cost zone line meet is the area per classroom you can use.

4—Multiply this by the number of classrooms you need. This gives you the overall size of your proposed school in gross square feet of floor area.

. . . To get total cost of building:

1—Select from table II, Cost of Schools per Square Foot, by the same process as above, the per-square-foot cost that corresponds to the square-feet-per-classroom that you picked.

2—Multiply this cost per square foot by the total square feet of floor area (from 4 above). This gives you the estimated building cost.

BUT keep in mind this gives you just a ROUGH IDEA of the cost. These are averages—an individual school will vary up or down depending on your local conditions. ALSO you have to add land costs, professional fees, furniture and equipment that can be moved around.

Your school cost will vary too with the above-average (or below) facilities you provide: for group activities—gyms, playrooms, auditoriums, other general or multiple use rooms; and for administration—offices, teachers rooms, storage space.

You may be able to do better than these costs even though materials prices and wage rates are higher than in 1951-52. Contractors are bidding lower today with materials easy to get.

For example, cost per square foot of 75 elementary schools in New York was $18.20. (See trend chart.) This compares with an average of $18.23 for fire-resistent and semi-fire-resistent in Zone 2 (which includes New York). These both represent prices for July, 1951, to September, 1952. In 1954, 67 similar schools went under contract in New York for $15.30 per square foot, a drop of almost 16%. In the first half of 1955, 8 New York schools went under contract at a median price of $14.92 per square foot. This is almost 17% under 1951-52 prices.

On the basis, then, of experience in New York State, school prices now should run less than those in tables.

This U. S. school cost analysis was made by N. E. Viles and Ray L. Hamon of the School Housing Section for the Office of Education, United States Department of Health, Education, and Welfare. It includes 3,003 schools and is based on data from applications for building materials under the Controlled Materials Program. In the period it covers, from July 1951 to September 1952, because of the Korea War, contractors had difficulties in getting materials, scheduling deliveries and forecasting working conditions.

The physical descriptions of buildings came direct from local school districts. The costs per square foot and the areas in square feet per classroom were derived by the authors.

The nine cost zones were selected to obtain the best grouping of states on the basis of construction practices, price levels and geography, since data for some individual states were insufficient to get valid averages. These are broad averages, unit costs vary among the states within a cost zone. They vary within a state (see urban vs. non-urban, also California costs).

III Average Square Feet per Classroom

By Type, By Size, By Location—As built, July, 1951 to September 1952

Elementary

Cost Zone	Average—All Types: Fire Resist	Semi-Fire Resist	Combustible	By Number of Classrooms: Fire Resistive 1-6 Rooms	Fire Resistive 7-13 Rooms	Fire Resistive 14+ Rooms	Semi-Fire Resistive 1-6 Rooms	Semi-Fire Resistive 7-13 Rooms	Semi-Fire Resistive 14+ Rooms	Combustible 1-6 Rooms	Combustible 7-13 Rooms	Combustible 14+ Rooms
1	1,754	1,698	1,976	1,659	1,799	593	.....	1,475	1,907	.....	4,056	1,775
2	2,295	2,043	1,784	2,057	2,430	2,434	2,878	2,199	2,059	1,641	1,742	1,801
3	2,046	1,858	1,720	2,025	2,048	1,914	1,911	1,553	1,697	1,947	1,724	1,647
4	1,803	1,739	2,091	1,990	1,579	1,737	1,927	1,767	1,982	.....	.....	1,540
5	1,732	1,639	1,541	1,787	1,513	2,056	1,457	1,644	1,525	.....	1,339	1,598
6	2,089	1,878	1,864	2,241	2,034	1,940	1,833	1,636	1,720	.....	1,865	.....
7	2,368	1,830	1,619	2,069	1,916	2,043	1,894	1,979	1,855	.....	1,741	1,703
8	1,922	1,931	1,898	1,891	1,772	1,930	1,603	2,024	1,702	.....	1,950	2,038
9	2,166	2,008	1,910	2,316	1,723	1,860	2,291	2,003	1,927	1,607	1,914	2,034
All	2,097	1,913	1,883	2,067	1,973	2,028	1,849	1,884	1,845	1,636	1,878	1,899

Junior and Senior High

Cost Zone	Fire Resist	Semi-Fire Resist	Combustible	Fire Resistive 1-6 Rooms	Fire Resistive 7-13 Rooms	Fire Resistive 14+ Rooms	Semi-Fire Resistive 1-6 Rooms	Semi-Fire Resistive 7-13 Rooms	Semi-Fire Resistive 14+ Rooms	Combustible 1-6 Rooms	Combustible 7-13 Rooms	Combustible 14+ Rooms
1	2,583	2,204	1,630	.....	2,583	.....	.....	.....	2,204	.....	.....	1,763
2	3,151	2,766	2,969	.....	3,181	2,893	.....	.....	3,080	.....	.....	2,969
3	2,643	2,083	1,712	2,315	1,821	2,817	1,548	2,383	2,074	1,214	1,842	.....
4	2,323	2,336	.....	.....	2,679	2,335	.....	1,916	2,051	.....	.....	.....
5	2,528	2,004	1,624	1,856	2,594	2,589	2,426	1,499	2,035	4,324	1,287	1,493
6	2,981	2,934	.....	6,674	3,135	2,452	1,932	2,636	2,823	.....	.....	.....
7	3,333	2,284	.....	2,936	3,061	2,946	2,517	3,258	.....	.....	.....	.....
8	2,693	2,513	3,400	.....	2,269	2,615	2,634	2,885	2,079	3,767	3,372	.....
9	3,202	3,001	2,703	2,861	2,550	3,300	1,537	2,952	2,781	2,278	3,496	2,401
All	2,879	2,562	2,439	2,897	2,624	2,746	2,131	2,586	2,388	2,814	2,305	2,356

Elementary

Cost Zone	Single vs Multi-story Schools: Fire Resistive 1-St	Fire Resistive 2-St or more	Semi-Fire Resist 1-St	Semi-Fire Resist 2-St or more	Combustible 1-St	Combustible 2-St or more	Urban vs Non-Urban Schools: Fire Resistive Urban	Fire Resistive Non-Urban	Semi-Fire Resist Urban	Semi-Fire Resist Non-Urban	Combustible Urban	Combustible Non-Urban
1	1,737	1,188	1,694	.....	1,976	.....	2,140	1,797	1,794	1,755	.....	2,163
2	2,174	2,420	2,125	2,259	1,785	.....	2,470	2,207	2,138	2,139	1,852	1,861
3	2,103	1,862	1,868	1,790	1,722	.....	2,291	1,840	2,120	1,606	1,753	1,618
4	1,778	1,919	1,804	.....	2,091	.....	1,737	1,614	1,976	1,959	2,073	.....
5	1,712	1,851	1,636	1,828	1,553	.....	1,764	1,600	1,781	1,771	1,543	1,509
6	1,984	2,339	1,863	2,223	1,865	.....	2,244	1,873	2,124	1,981	1,265	2,221
7	2,259	2,403	1,810	2,623	1,741	1,703	2,387	2,084	1,973	1,710	1,867	1,666
8	1,881	2,192	1,928	2,050	1,892	1,939	1,944	1,966	1,929	1,972	2,171	1,695
9	2,028	2,522	2,006	2,469	1,919	.....	1,853	1,886	1,941	1,747	1,949	1,902
All	2,001	2,302	1,920	2,185	1,885	1,849	2,185	1,919	1,977	1,849	1,919	1,789

Junior and Senior High

Cost Zone	Fire Resistive 1-St	Fire Resistive 2-St or more	Semi-Fire Resist 1-St	Semi-Fire Resist 2-St or more	Combustible 1-St	Combustible 2-St or more	Urban vs Non-Urban Schools: Fire Resistive Urban	Fire Resistive Non-Urban	Semi-Fire Resist Urban	Semi-Fire Resist Non-Urban	Combustible Urban	Combustible Non-Urban
1	.....	2,583	1,966	2,550	1,763	.....	.....	2,583	1,966	2,550	.....	1,763
2	2,847	2,241	3,330	2,541	2,969	.....	3,233	2,583	.....	2,766	.....	2,969
3	2,346	1,959	2,204	2,049	1,880	1,437	2,730	3,418	2,259	2,269	1,437	2,213
4	2,191	2,429	1,821	2,792	.....	.....	2,135	2,278	1,745	1,969	.....	.....
5	2,218	2,798	1,947	2,305	1,624	.....	3,145	1,782	2,067	2,060	.....	1,842
6	2,971	2,985	2,935	2,931	.....	.....	3,185	2,453	3,377	2,258	.....	.....
7	3,466	3,271	2,438	.....	.....	.....	3,332	3,027	.....	2,492	.....	.....
8	2,607	2,766	2,301	2,442	3,554	.....	2,899	2,092	2,224	2,891	.....	3,554
9	3,276	3,172	2,858	2,986	2,708	.....	3,181	3,228	3,396	2,899	2,780	2,754
All	2,629	2,624	2,538	2,585	2,459	1,437	3,005	2,617	2,641	2,504	2,692	2,462

Classrooms: INCLUDE all SPECIAL-USE rooms—homerooms, laboratories, homemaking, art, music, business education, shops. DO NOT INCLUDE any GENERAL-USE rooms—gymnasiums, auditoriums, lunchrooms, other.
To estimate total square feet of gross floor area within the building perimeter, including the sum of all floors, multiply the average per classroom from this table by the number of classrooms in proposed school. This total, multiplied by the square-foot costs in companion table II gives estimated total school building cost.

School Cost Study Covers . . .

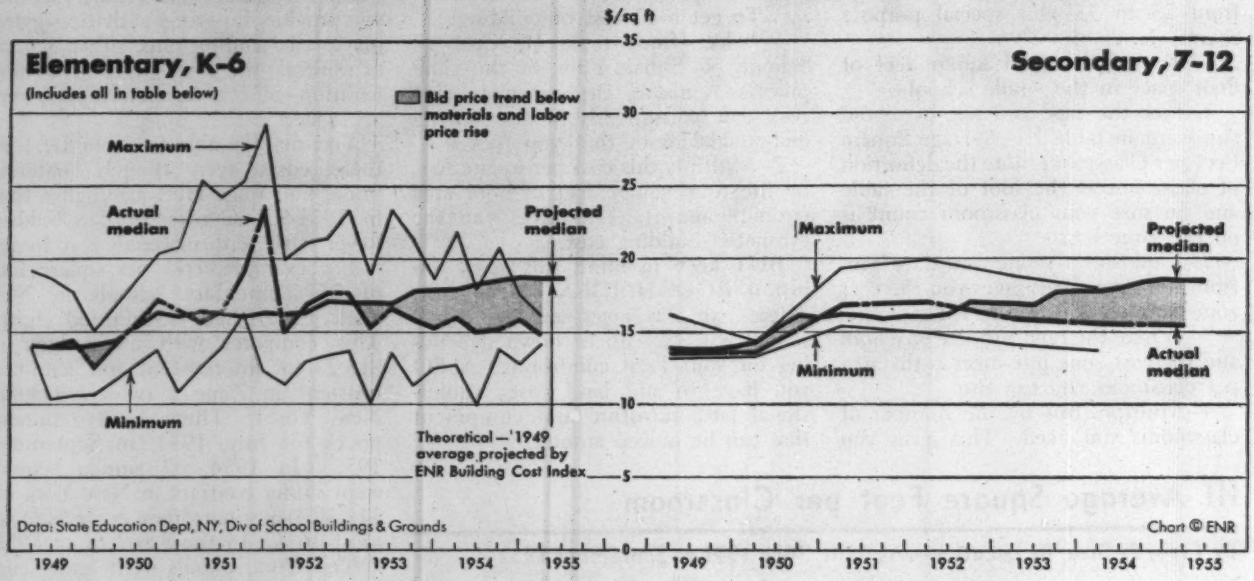
. . . These three types of construction

Fire-resistive: entirely of fire-resistive materials, or with fire-resistive bearing and partition walls, floor slabs, stairways, and ceiling

Semi-fire-resistive: fire-resistive bearing walls, corridors, and stairways—ordinary construction elsewhere

Combustible: all frame, or fire-resistive veneer on wood frame, or fire-resistive bearing walls, and otherwise combustible construction

Timing-Bid Prices Now Favor School Building



New York Schools Cost This Much per Square Foot

Elementary, K-6

	No. of Schools K-6 Total	$ per sq ft for schools with ... 1 Large Unit* Min	Med	Max	... 2 Large Units* Min	Med	Max	... 3 Large Units* Min	Med	Max
1949	29	$10.40	$14.00	$19.20	$12.00	$14.60	$18.70	.....	.....	.....
1950	20	10.85	17.00	20.80	13.75	16.66	17.80	.....	.....	.....
1951	59	12.30	16.45	25.40	18.70	20.25	22.60	$13.90	$23.60	$29.20
1952	57	11.40	16.30	20.20	13.00	17.60	21.10	14.20	18.20	23.30
1953	65	10.20	16.05	23.40	13.60	16.15	19.40	11.30	16.30	18.80
1954	70	10.00	14.55	20.80	12.80	16.05	21.80	14.80	15.30	18.40
1955 1st Quarter	8	.....	16.20	.....	14.10	14.95	15.90	.....	14.90	.....

Secondary, 7-12

	No. of Schools 7-12 Total	$ per sq ft Min	Med	Max
1949	4	$13.20	$13.55	$16.20
1950	4	13.35	13.70	14.40
1951	6	15.40	16.97	19.30
1952	7	15.00	17.10	19.90
1953	12	14.15	16.00	18.80
1954	17	13.70	15.60	18.00
1955 1st Quarter	1	.....	15.50	.....

* Large Unit includes a general purpose room, gymnasium, auditorium, multi-purpose or other group activity room
These are costs based on the four contracts—general construction, plumbing, electrical, heating and ventilating. They include built-in features, but no movable furniture or equipment. Some minor site improvement may be included, but no major site work and no land costs.

School prices are down in the face of rising prices for labor and materials. This is the experience in New York where schools are reported in numbers sufficient to detect this trend, even when they are subdivided into the special groups shown.

New York aims at classes that average 27 pupils, but cannot always hit this ideal for elementary schools. The average space per pupil in these schools is shown in tables.

While New York schools are built to house various assortments of grades —kindergarten through third (K-3), 7-9, 10-12, K-4, K-9, K-12 and others —the trend is more and more to K-6 and 7-12. These two types predominate in each of the years studied and account for 308 elementary and 51 secondary schools whose prices per square foot are analyzed in the table above. This gives a basic framework for estimating cost or judging price of individual schools. It shows the range from minimum to maximum and where the midpoint falls.

Some of the reasons for the lower prices since 1952, found in studies of individual cases by Don L. Essex, Director, Division of School Buildings and Grounds, The State Education Department, include: simplicity of design, use of stock materials that aid ease of execution and rapid scheduling, completeness of plans submitted for bids, timing of call for bids when contractors are not too busy, new techniques that include exposed structural features.

Highly competitive bidding dominates all other reasons for lower costs. But the prices it produces come in part from the increased overall productivity in design and construction that is a by-product of experience.

New York Schools Provide This Space Per Pupil

Individual schools vary as much as 20 sq ft more or 20 sq ft less per pupil than the medians shown in the table.

Elementary

Size No. of Pupils	Space—Square Feet per Pupil—Median By Type of School—No. of Large Units* in Plan 1	2	3
100	93	103	127
200	89	101	124
300	84	98	120
400	80	96	117
500	75	93	113
600	71	91	110
700	66	88	106
800	61	86	103
No. of Schools	159	169	44

* Large Unit includes a general purpose room, gymnasium, auditorium, multi-purpose or other group activity room
New York State Education Department requires one or more group activity rooms in schools of more than two classrooms

High School

Size No. of Pupils	Space—Square Feet per Pupil—Median Sq Ft per pupil	Size No. of Pupils	Sq Ft per pupil
400	138	1,300	104
500	134	1,400	100
600	130	1,500	97
700	126	1,600	93
800	123	1,700	89
900	119	1,800	86
1,000	115		
1,100	112	No. of Schools	79
1,200	108		

An auditorium, gymnasium and special purpose rooms are standard practice for secondary schools and account for the higher space per pupil
Data from The State Education Department, New York; Division of School Buildings and Grounds

Features that make an ideal SCHOOL window

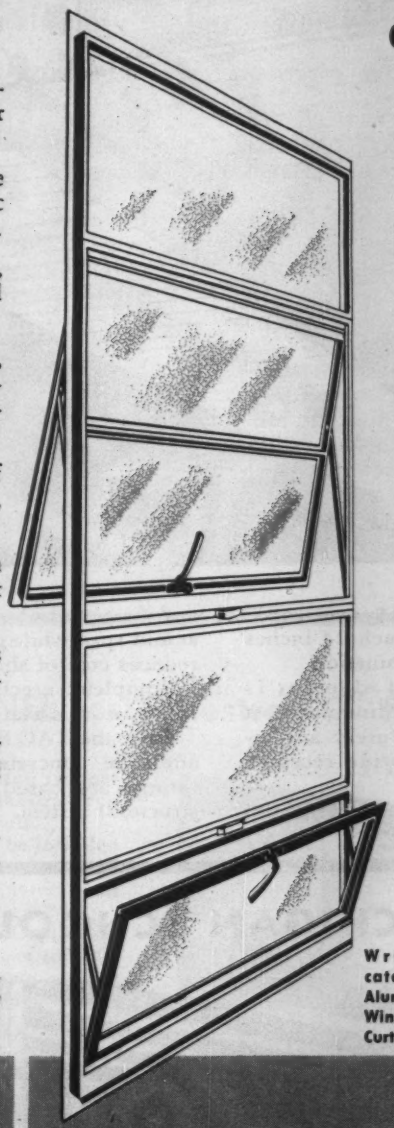
Bayley

aluminum projected windows*

(Same type also available in steel)

UTILITY

- Offers the ideal combinations of natural daylight, ventilation and visibility for any need.
- Well suited to any type of architecture or construction. Also forms the basic element in Bayley Curtain Wall Systems.
- Easily installed in prepared openings, and readily adaptable to all curtain wall construction systems.
- Permits use of draperies, shades, curtains, venetian blinds, or various combinations of window accessories, with minimum interference.
- Positive, direct-action hardware of quickly apparent operation . . . No gears, cranks, or complex mechanism.
- Refreshing all-weather air circulation provided by awning-type ventilators that shield opening against rain.
- Draftless, indirect air circulation is provided through fully adjustable projected-in ventilators.
- Exterior of entire window easily washed from indoors. Ends the hazard of having to wash windows from outside.
- Screening easily accomplished. Projected-out ventilators screened inside; projected-in units screened outside.



CONSTRUCTION

- Extra deep sections — ample even for Thermopane or Twindow glazing up to ½-inch thick.
- Thicker, sturdier, aluminum sections, made especially for windows give extra strength, rigidity, durability.
- Full 1⅝" ventilator sections, with double contact surfaces parallel to face of window, assure weathertight closure, minimum air leakage.
- Frame and ventilator corners are accurately coped, tenoned, and riveted, for lasting ruggedness and accuracy of fit.
- Ventilators operate on sturdy balance arms connected to sliding friction pivots having non-abrasive shoes with compression springs sealed against dirt.
- Rugged streamlined hardware with easy-grip white bronze handles. Hardware securely attached with stainless steel screws.
- Full ⅝-inch wall engagement provides greater security and rigidity in any type of construction.
- Provision for bed and face putty outside leaves flat, easy-to-clean surfaces inside — the mark of a truly quality window.
- Ventilators glide smoothly and easily, hold at any position, and are not affected by moisture, warping, or sticking.

See Bayley in Sweet's. Complete catalogs on aluminum windows, 16a/Bay; steel windows, 16b/Ba.

Write TODAY for catalogs on Bayley Aluminum and Steel Windows and Bayley Curtain Wall Systems.

QUALITY APPROVED

76 Years of RELIABILITY

*BAYLEY CURTAIN-WALL SYSTEM

The Bayley Intermediate Projected Window is the basic element in the Series 150 Bayley Curtain Wall System. It is also built into separate prefabricated panels composed of deep-sectioned framing members in the 450 series.

THE WILLIAM BAYLEY COMPANY

Springfield, Ohio

District Sales Offices: Springfield Chicago New York Washington

Agents in All Principal Cities

Here's how the New Fenestra TAC Panel System works! Troffer or acoustical panel units—each 24 inches wide—may be arranged in any combination.

A noncombustible acoustical element is "built in" the acoustical panels. Minimum-cost fluorescent fixtures and plastic diffusers are installed in the troffer panels to provide recessed lighting.

Long-span design makes for quick erection, and the panels need support only on the ends and at mid-span while concrete is being poured. This reduces cost of shoring usually required.

Complete erection service under Fenestra supervision is available in many areas.

Since the TAC Panels carry no building loads after the concrete has cured, all fire-resistive ratings are based on the reinforced concrete structural system.

PROVEN IN MICHIGAN SCHOOL BUILDINGS

TAC Panels in place, ready for pouring concrete at one of 14 Michigan schools now under construction with this new system. See how the long span design reduces shoring requirements to only mid-point support. **Marsh School**, Detroit, Michigan. *Architect:* C. Gabler. Detroit Board of Education, George L. Schulz, *Consulting Architect.* *Contractor:* Ellis Construction Co.

Here's a quiet, well-lighted classroom . . . the result of TAC Panel construction. Maintenance costs are low, because the ceiling can be washed or painted as needed, without reducing the acoustical efficiency. The plastic diffusers are easily removed for servicing lighting fixtures. **Pasteur School**, Detroit, Michigan. *Architect:* Leo M. Bauer. *Contractor:* Maurice Strandberg Co.

An ideal ceiling for gymnasiums and multi-purpose rooms. The acoustical treatment "built in" the cellular steel panels cannot be damaged by balls thrown against it. The recessed lighting fixtures are economically protected by wire guards. **Gompers School**, Detroit, Michigan. *Architect:* Donaldson & Meier. *Contractor:* A. W. Kutsche & Co.

FENESTRA TROFFER-ACOUSTICAL PANEL SYSTEM CUTS COST OF REINFORCED CONCRETE SCHOOL CONSTRUCTION

Multi-purpose Steel Panels provide long-span forms for concrete joists *plus* acoustical ceilings and recessed lighting troffers *built right in!*

Multi-purpose is the key to economy in school construction. The NEW Fenestra* Troffer-Acoustical Panels (TAC Panels, for short) are designed for multi-purpose use of materials and construction labor. They permit you to have acoustical treatment and lighting—features that usually require extra time and labor—*built right in the structure itself.*

Money is saved because 3 expensive building materials are wrapped up in these economical building panels: (1) the forms for concrete joist construction, (2) metal pan acoustical ceilings, and (3) recessed lighting troffers.

Time is saved because the structural floor for the rooms above and the acoustical ceiling and lighting system for the rooms below are completed at the same time . . . with only paint, finished flooring and installation of fluorescent fixtures to be done after the concrete has cured.

And, this new building system gives you better-looking, better-lighted classrooms that are easier to maintain, year after year. The ceilings can be washed or repainted as often as needed, without affecting the acoustical treatment. There is no hanging ceiling or "stuck on" acoustical material to be damaged or replaced.

Investigate the New Fenestra TAC Panel System now. Even if you have plans on the drawing board, they may easily be adapted to use it. Write today for your copy of the new brochure, *Fenestra TAC Panel System.* Detroit Steel Products Co., Dept. ER-5, 2286 East Grand Blvd., Detroit 11, Michigan.

*Trademark

NEW! TROFFER PANEL for Fenestra "D" Panel Construction in one-story schools

Now you can have *built-in* troffer lighting in one-story school buildings designed with Fenestra Type "D" Acoustical-Structural Building Panels.

Standard troffer lighting fixtures may be installed flush with the acoustical ceiling in this new Type "D" Troffer Panel, eliminating hanging fixtures and exposed wiring conduits.

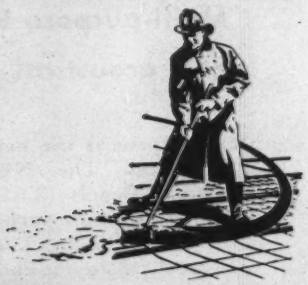
Write Detroit Steel Products Company, Dept. ER-5, 2286 East Grand Blvd., Detroit 11, Michigan, for your copy of the new book, *Fenestra for Schools,* and for complete details on this new Troffer Panel.

Fenestra

TAC

TROFFER-ACOUSTICAL BUILDING PANELS

Another school protected with Gold Bond "Firefighter" Roof Deck



Lufkin High School, Lufkin, Texas. *Architect:* Wilbur Kent, Lufkin; *General Contractor:* Lufkin Construction Co., Lufkin; *Roof Deck Applicator:* Lydick Roofing Co., Houston, Texas.

From foundation to roof this modern new Texas high school was designed and built to give students the *best,* both in educational facilities *and in safety.* That's why a Gold Bond "Firefighter" Roof Deck was specified. Over 80,000 sq. ft. of incombustible gypsum protects this building against spreading fires. The gypsum will not transmit high temperatures and does not warp when exposed to fire. One-inch Econacoustic Roof Formboard was used to insulate *and* sound-condition. The under-surface of the formboard creates a finished interior ceiling.

Gold Bond Gypsum Roof Decks go up fast . . . *up to 30,000 sq. ft. can be poured in a single day.* Quick setting action permits full load capacity in under an hour. "Firefighter" Roof Decks are adaptable to pitched, barrelled or flat roof designs. Their low dead loads permit lighter supporting structures and allow substantial construction savings. Roof decks are easily molded in place around vents and sky-lights, and also around irregular slopes and valleys for flowing drain water.

Find out what "Firefighter" Roof Decks can mean to your building plans. Write for full details. Address: Dept. EN-65, National Gypsum Company, Buffalo 2, New York.

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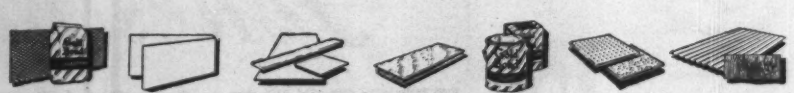
Build better with Gold Bond



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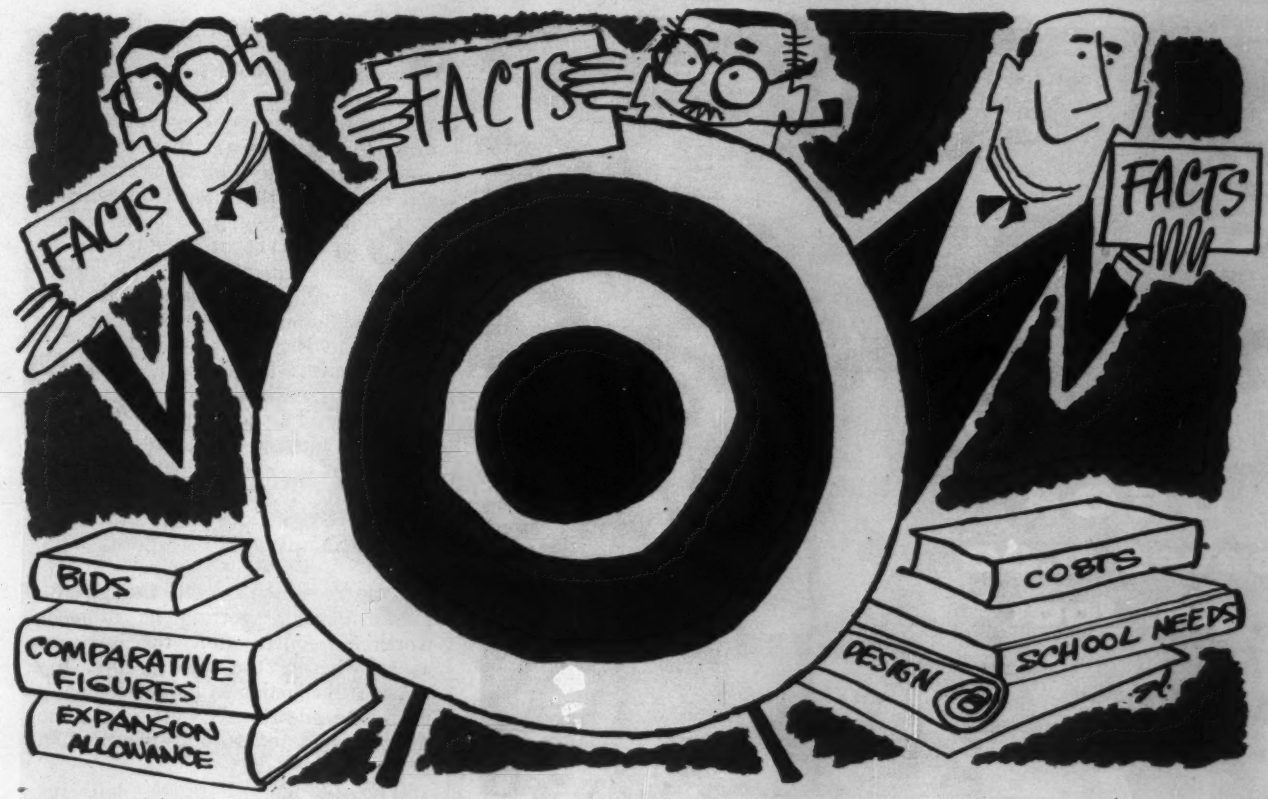
. . . **"FIREFIGHTER" GYPSUM ROOF DECK**



How to Cope With Budget Critics

Anyone in the construction industry who gets involved in the design or construction of a new school should expect to be exposed to some unjustified criticism. If you value good public relations, don't let these unfounded charges go unanswered.

In every school district there are bound to be some vociferous citizens who protest the cost of their new school, which will be reflected in the next tax bill, even though the facts have been presented at meetings long since held. They remember what the old one cost, or they have heard that nearby Park Hollow just built a beautiful school for far less money. Or maybe they believe the community doesn't really need a new school. So they ask, "Why does the school cost so much? Are we getting our money's worth?"

A few go farther, with real below-the-belt blows. They have been known to accuse architects of trying to make the school a monument to themselves, of making it as costly as possible in order to increase design fees. Without a shred of evidence, they sometimes accuse contractors of collusion in preparing bids to eliminate competition, of scheming to make exorbitant profits on a government job and even of padding bids for kickbacks to the local school board.

The best way to answer these accusations is with facts and figures. Make it clear that the architect was conscientious not only in turning out an esthetically satisfactory structure that meets educational needs in the community, but also in keeping costs down. He knows that potential clients reviewing his work will check on costs. Explain also that contractors are forced by competition to pare bids to a minimum. Point out that the school board is composed of honest, dutiful citizens who don't like to pay higher taxes any more than anyone else does, and they oversee all phases of design and construction. Furthermore, if your state has a watchdog education department, call attention to state supervision of the project.

• **Money's worth?**—Next, show the taxpayers that they are really getting their money's worth. One way is to compare the various contractors' bids with each other, with the amount budgeted for the school and with the architect's estimate of cost. This comparison should bring out the following points:

1. The number of bids received is an indication of the amount of competition for the job.

2. The spread between bids is a measure of how close the contractors figured. The smaller the spread the more likely the district got a good price.

3. The low bids were submitted by reputable contractors.

4. The amount the low bids were above or below the amount budgeted for the school or the architect's estimate.

It is easy to show that the public is getting its money's worth if there are enough bids and close figuring to indicate intense competition and if the low bids are below the budget or architect's estimate. Otherwise, other cost comparisons will have to carry the full burden of proof.

To carry on, compare the cost of the new school with that of others built recently. You would have an ideal check if you could find a new school in the same general area with identical facilities. This, however, is very unlikely to happen. So you probably will have to make use of available data for somewhat different schools, as explained in another article in this issue (p. 69).

Such a comparison will indicate where the unit costs for your school fall within the range for other schools of about the same size and type of

Architects: Otis and Grimes, Louisville
Contractor: D. R. Selley Construction, Nashville
Lowes Elementary School, Lowes, Kentucky

On this school is the report, "We are quite enthusiastic over appearance, insulating and sound absorbing qualities of Tectum. At least a dollar per square foot was saved — under the cost of a conventional acoustical ceiling."

The exposed Tectum Deck is anchored to an open web steel joist system. Cubage was reduced by figuring required ceiling height to the decorative underside of the deck.

Other values in Tectum — noncombustibility, safe load factors, stability, and resistance to rot, termites, etc., will protect the youngsters for years . . . and its combined values keep maintenance costs down. It's worth looking up — to Tectum.

Tectum Div., The Alliance Manufacturing Company
130 South Sixth Street
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Please send Technical Data to me.

Ⓢ See It Now! Ask for 1955 technical data or refer to Section 2e/Te, Sweet's Architectural File.

Name _____ Title _____

Address _____

City _____ State _____

Tectum
the 9-value
roof deck

construction. If you can show that your unit costs are in the lower bracket, there should be no difficulty in convincing the taxpayers that they are getting their money's worth. You may also have to use these costs to indicate that the architect's estimate was too low or the budget unrealistic.

If, however, your unit costs are in the upper bracket, it would be wise to offer an explanation. Call attention to facilities that local educators and the community required but other schools in the low-cost bracket do not have. In addition, point out that every effort was made to get good bids: The job was well advertised and attracted several reputable contractors to submit bids; these firms were not overloaded with other work and so were anxious to get this job; they had ample time to prepare bids.

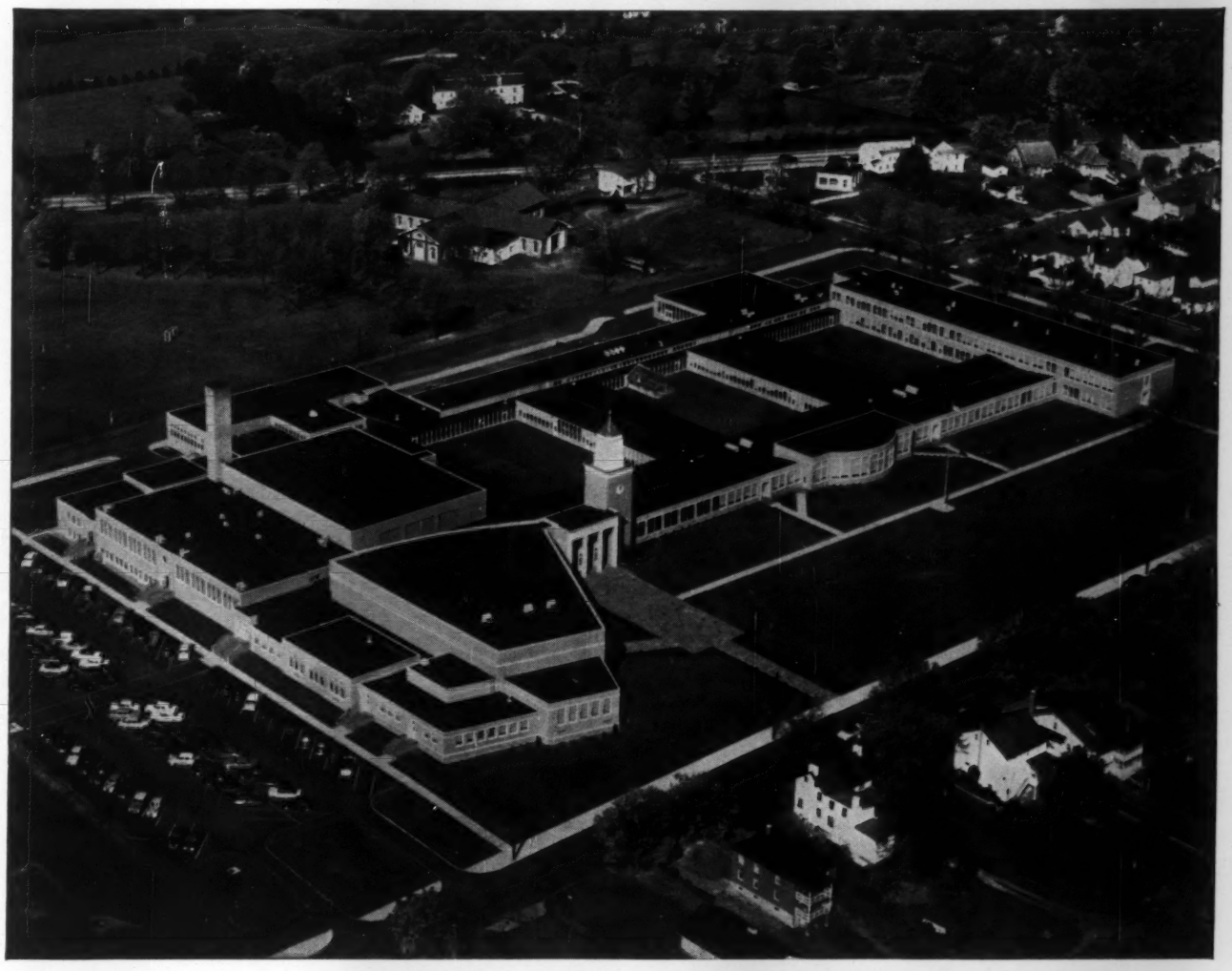
• **Cost too much?**—Even though the public may be getting its money's worth on construction, the question as to whether the school costs too much still remains to be answered. It raises the additional point that there may be more school plant than needed.

The burden of proof that the school is neither over-designed nor over-equipped rests with the architect and the local educators. They should jointly demonstrate that the school really needs all the facilities included. If any are over-sized to meet other than educational needs, it should be made clear that this was the community's wish.

The architect should show, in addition, that his design criteria were not too elaborate, that the community would not be happy with less costly material and equipment. Substitutes might cost more in the long run in higher costs for alterations, extensions, maintenance, repair and operation. If provision for flexibility and future expansion involves some expense, he should demonstrate that the cost is not excessive and these provisions will pay off.

The educator in charge of the construction program should show that his criteria, too, are not too elaborate. One way is to compare the requirements for the school with the state education department's minimum and maximum criteria. It would also help to compare the school with other schools and with recommendations made by leading educators.

Answering critics with facts and figures in this manner should win over many of them, confirm the faith of taxpayers who already favor the program, and still false rumors before they spread too far and seriously damage the reputation of all involved in the school contract.



Central Bucks High School, Doylestown, Pa. *Architects:* Davis, Dunlap and Carver; *General Contractor:* Wark and Company — both of Philadelphia. *Steel Fabricator:* Lehigh Structural Steel Company, Allentown, Pa.

NEW SCHOOL IN BUCKS COUNTY, PA., SERVES NINE RURAL DISTRICTS

This new school, located at Doylestown, Pa., in the center of Bucks County, is a fine example of the consolidated school — a frequently happy solution to the problem of overcrowding. Here nine rural school districts joined forces to build the Central Bucks High School, in that way creating far better and more spacious facilities than each district could have provided on its own.

The school is of predominantly one-story design with classrooms built on a central court plan for maximum natural daylight, and equipped with gymnasiums, cafeteria, library and shops. The planners of the Central Bucks school wanted the most spacious and up-to-date facilities they could get for their tax dollars, and they wanted strength and durability as well.

Here, as in so many of today's new schools, a framework of Bethlehem structural shapes was used beneath the brick exterior. Inside, Bethlehem open-web steel joists spanned rooms without the need for interior supporting columns. These strong, lightweight steel members, shipped fully fabricated and ready for placement, helped speed construction and keep costs down.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

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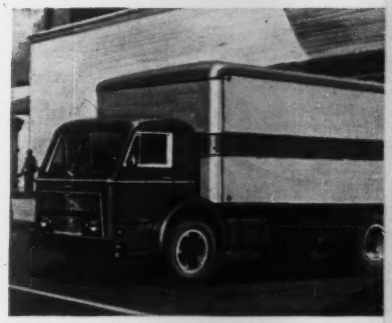
You've heard it before—
You'll be hearing it more...

Mack's got it!



You'll find a wide and growing agreement among truck users these days. And they're putting it into the strongest words possible . . . ***Mack's Got It!***

It takes a lot of doing to deserve such all-out praise. How it all happened is quite a story. But you can get the gist in one simple statement of fact:

Mack is the only manufacturer to provide a completely new line of heavy-duty trucks since World War II . . . trued to the special requirements of modern business and industry.

Completely *new* means just what it says. New concepts. New designs. New engineering. New processes and metallurgy. Everything that contributes to greater operating economy, better performance, more profitable payloads, and assured safety. No effort or expense has been spared to realize these benefits . . . all with traditional Mack strength and dependability.

Look over these major achievements:

The most economical truck engine on the road today, the Mack-built Thermodyne® Diesel delivers more miles per gallon than any other engine handling like loads. It's a big reason why more Mack diesel trucks are bought each year than any other make.

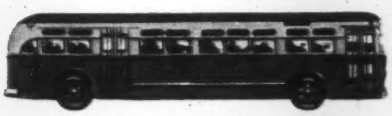
Maximum payload capacity for trucks and tractors through chassis design which combines greatest compactness with maximum accessibility of components and light weight.

Trucks that won't bog down under the most adverse conditions of mud, gravel or sand . . . because of traction supplied by famous Mack-built four-wheel-drive rear axle assembly combined with exclusive Mack Power Divider.

Newest Cab-Over-Engine design, either tilt-type or the revolutionary new raise-type Verti-Lift Cab, the ultimate in basic "cab-over" design.

When you get all the facts, we think you'll see that you can't afford *not* to own a Mack . . . and you'll agree ***"Mack's Got It!"***

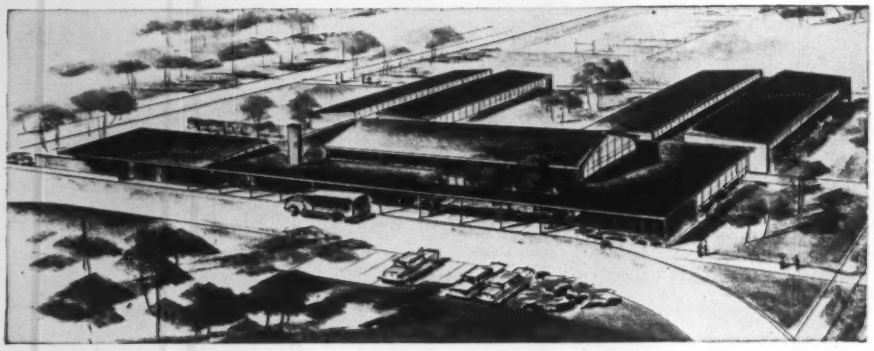
Mack TRUCKS



Mack Buses and Fire Apparatus have also been advance-engineered to best serve their important fields. *All along the line, Mack is really going places!*

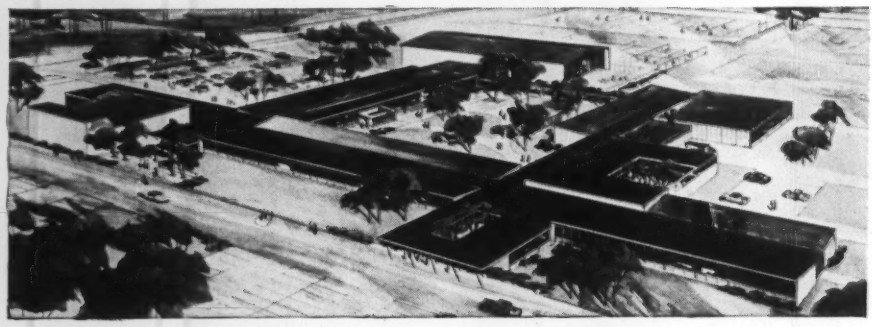
Because V-LOK Reduces Erection Costs

A school designed with a V-LOK Steel Frame can be erected and under roof in a very few days—using a minimum of skilled labor and equipment to expense against the job. Interlocking structural members require no bolting, riveting or welding — except anchor bolts.



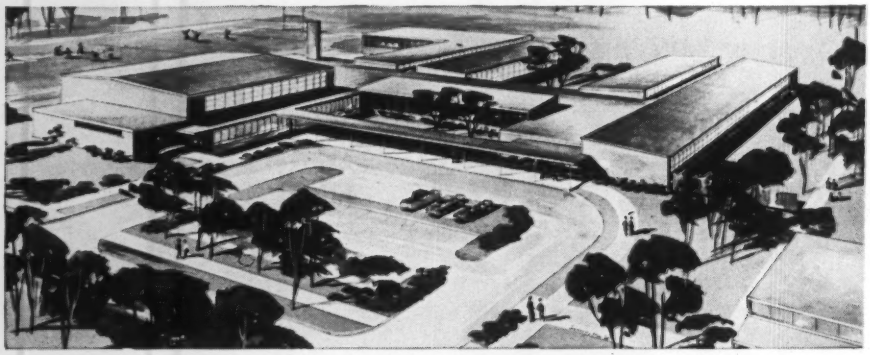
Because V-LOK Gets a School Under Roof Faster

A school under roof in a few days permits craftsmen to move in and start finishing operations for much earlier occupancy. This speed combined with actual economies—per sq. ft.—puts a School Board definitely over on your side for future expansions.



Because V-LOK Designs Readily Into School Layouts

With V-LOK—you're the Architect, unhampered in the most modern layouts you want to design. You have adequate spans and loading capacity plus a practical joining of accessory materials and component structural units. Contact us for design standards.



Illustrated here are three of the many V-LOK Schools designed by Walter Anicka of Ann Arbor, Michigan. At the top is the Saline Elementary School, Commermercial Const. Corp., General Contractor.

Second is the Willow Run High School, Birchard & Roberts, Dearborn, Gen. Contractor. Third is the South Lyon High School, A. N. Hickson, Inc., General Contractor, Detroit, Michigan.

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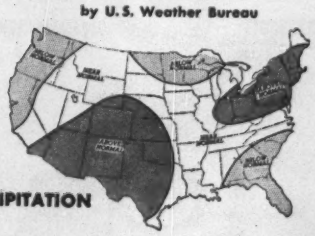
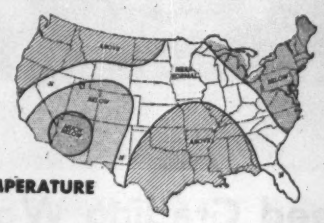
STRUCTURALS

30-DAY WEATHER OUTLOOK

Mid-May to mid-June
by U.S. Weather Bureau



PRECIPITATION



TEMPERATURE

Observed weather in 20 cities, compared with normals

	Precipitation, inches				Temperature, degrees			
	Apr. 1955	Precipitation, Inches Departure fr. normal	4 Mos. 1955	Departure fr. normal	Apr. 1955	Departure fr. normal	Av. daily maximum	Av. daily minimum
Atlanta	4.31	−0.11	16.49	−3.09	65.9	+4.2	76.7	55.1
Baltimore	2.34	−1.38	8.65	−5.35	55.9	+3.5	65.8	45.9
Birmingham	6.42	+1.77	21.75	+0.64	66.3	+4.4	78.5	54.1
Boston	4.12	+0.66	14.57	+1.25	49.2	+2.0	56.2	42.1
Chicago	2.01	−0.81	7.05	−1.87	57.0	+8.9	67.8	46.2
Cincinnati	2.92	−0.72	16.80	+3.10	59.6	+6.0	70.3	48.9
Cleveland	3.72	+0.99	14.22	+4.10	55.9	+8.6	67.1	44.7
Dallas	1.98	−1.89	6.96	−4.81	70.2	+3.9	81.0	59.4
Denver	0.31	−1.59	1.74	−2.46	52.0	+3.4	65.0	39.0
Detroit	2.00	−0.91	8.29	−1.25	54.5	+8.1	64.8	44.1
Kansas City	1.60	−2.01	7.77	−0.94	63.3	+7.5	74.4	52.1
Los Angeles	2.07	+0.90	7.61	−1.67	61.3	−2.2	71.5	51.1
Minneapolis	0.92	−0.99	3.45	−1.63	53.9	+7.9	65.0	42.8
New Orleans	6.63	+1.18	19.53	−1.44	72.5	+2.7	80.8	64.1
New York	2.39	−0.83	10.33	−3.04	52.9	+3.1	61.2	44.6
Philadelphia	1.93	−1.45	9.67	−3.42	55.9	+4.3	66.0	45.8
Pittsburgh	4.41	+1.05	13.24	+1.29	58.5	+6.7	68.9	48.1
St. Louis	2.81	−1.20	9.73	−2.12	63.6	+7.1	72.5	54.7
San Francisco	1.49	0.00	7.01	−5.20	52.3	−3.4	57.4	47.1
Seattle	2.20	+0.26	8.62	−4.61	47.2	−4.6	54.2	40.2

Precipitation range in 20 cities, in inches

Table shows range observed 33.3% of time. Rainfall heavier 33.3% of time, lighter 33.3% of time.
Computed by U. S. Weather Bureau (based on historical records of actual precipitation)

City	May	Mid May-Mid June	June	Mid June-Mid July	July	Mid July-Mid Aug.	Aug.	Mid Aug.-Mid Sept.	Sept.*	Mid. Sept.-* Mid. Oct.	Oct.	Mid. Oct.-Mid. Nov	Nov.	Mid Nov. Mid Dec.
Atlanta	2.14/4.33	2.50/4.38	2.87/4.43	2.93/4.62	2.99/4.80	2.89/4.90	2.79/5.00	2.24/4.30	1.69/3.60	1.64/3.35	1.59/2.90	2.01/3.38	2.43/3.85	2.94/4.58
Baltimore	2.94/4.40	2.73/4.42	2.52/4.44	2.57/4.71	2.61/4.98	2.91/5.32	3.20/5.66	2.65/4.51	2.10/3.36	1.88/3.57	1.66/3.77	1.16/3.45	1.56/3.12	1.99/3.43
Birmingham	3.16/4.55	2.90/4.70	2.64/4.84	3.29/5.18	3.94/5.53	3.44/5.39	2.92/5.25	2.32/4.47	1.71/3.69	1.62/3.14	1.52/2.58	1.84/3.24	2.17/3.91	2.94/4.83
Boston	2.39/3.50	2.42/3.84	2.09/3.50	2.35/3.76	2.61/4.02	2.60/4.36	2.59/4.70	2.32/4.20	2.04/3.70	2.26/3.88	2.49/4.07	2.62/4.26	2.74/4.46	2.82/4.33
Chicago	2.16/4.00	2.29/3.83	2.42/3.67	2.46/3.66	2.49/3.65	2.31/3.65	2 13/3.65	2.11/3.70	2.09/3.75	1.84/3.42	1.59/3.10	1.59/2.95	1.59/2.80	1.46/2.62
Cincinnati	2.49/4.10	2.59/4.30	2.69/4.50	2.54/4.10	2.39/3.70	2.32/3.95	2.24/4.20	2.02/3.64	1.79/3.08	N.A.	1.49/2.90	1.74/3.28	1.99/3.67	2.14/3.48
Cleveland	2.33/3.49	2.17/3.53	2.00/3.56	2.24/3.82	2.47/4.08	2.15/3.84	1.83/3.60	2.07/3.51	2.30/3.41	2.03/3.29	1.75/3.16	1.79/2.97	1.82/2.77	1.76/2.68
Dallas	2.99/5.25	2.39/4.85	1.79/4.45	1.59/3.72	1.39/3.00	1.30/2.89	1.22/2.78	1.50/2.94	1.77/3.10	1.66/3.30	1.55/3.50	1.60/3.25	1.64/3.00	1.36/3.00
Denver	1.62/2.90	0.64/2.32	0.67/1.75	0.94/1.88	1.21/2.60	1.04/1.86	0.87/1.73	0.60/1.39	0.52/1.05	0.57/1.08	0.62/1.10	0.46/0.89	0.29/0.68	0.34/0.72
Detroit	2.49/3.67	2.66/3.88	2.84/4.10	2.46/3.90	2.09/3.70	1.94/3.54	1.79/3.38	1.80/3.41	1.82/3.44	1.72/3.02	1.63/2.69	1.70/2.66	1.77/2.78	1.70/2.66
Kansas City	3.24/5.40	3.42/5.82	3.61/6.25	3.19/5.47	2.77/4.69	2.74/4.84	2.70/5.00	2.84/5.00	2.99/5.00	2.34/4.54	1.69/4.07	1.48/3.21	1.27/2.35	1.02/1.95
Los Angeles	0.05/0.35	0.02/0.18	0.00/0.02	0.00/0.01	0.00/T	0.00/T	0.00/T	0.00/0.02	T/0.03	0.08/0.32	0.15/0.60	0.20/0.95	0.26/1.30	0.70/2.00
Minneapolis	2.64/3.98	2.89/4.49	3.14/5.00	2.64/4.50	2.14/4.00	2.10/3.85	2 1s/3.70	2.24/3.78	2.29/3.85	1.79/3.15	1.29/2.45	0.98/2.01	0.67/1.57	0.62/1.44
New Orleans	2.64/5.25	3.18/5.88	3.72/6.50	4.54/6.95	5.37/7.40	4.90/7.08	4.44/6.75	3.78/6.12	3.11/5.50	2.55/4.81	1.99/4.12	2.34/4.40	2.69/4.67	2.96/4.92
New York	2.54/4.02	2.45/3.91	2.36/3.80	2.81/4.25	3.26/4.70	2.99/4.95	2.89/4.70	2.46/4.30	2.21/3.40	2.15/3.76	2.09/4.13	2.15/4.04	2.21/3.95	2.42/3.86
Philadelphia	2.39/4.40	2.54/4.25	2.69/4.10	2.94/4.24	3.19/4.37	2.99/4.91	2.79/5.45	2.44/4.62	2.09/3.90	2.04/3.85	1.99/3.80	2.18/3.65	2.36/3.50	2.50/3.70
Pittsburgh	2.49/3.75	2.68/3.98	2.86/4.20	2.79/4.35	2.72/4.50	2.52/4.15	2.32/3.80	2.20/3.30	1.87/2.80	1.98/3.00	2.09/3.20	1.96/2.96	1.84/2.72	1.96/3.00
St. Louis	3.13/5.20	2.96/5.25	2.79/5.30	2.60/4.78	2.41/4.25	2.28/4.18	2.14/4.11	2.12/3.84	2.09/3.58	1.89/3.42	1 09/3.25	1.78/3.28	1.86/3.30	1.70/3.05
San Francisco	0.18/0.69	0.09/0.37	0.00/0.05	0.00/0.03	0.00/0.01	0.00/0.00	0.00/0.00	0 00/0.13	0.00/0.26	0.10/0.73	0.19/1.20	1.12/2.25	1.04/3.30	1.62/4.28
Seattle	1.42/2.00	1.09/1.86	0.76/1.73	0.48/1.20	0.19/0.67	0.18/0.78	0.18/0.90	0.62/1.55	1.07/2.20	1.70/2.85	2.32/3.50	3.07/4.55	3.82/5.60	4.00/5.74

T—Traces (Less than 0.005 inches)

Mean temperature range in 20 cities, in degrees F.

Table shows range observed 25% of time. Mean temperature higher 37.5% of time, lower 37.5% of time.
Computed by U. S. Weather Bureau (based on historical records of actual temperature)

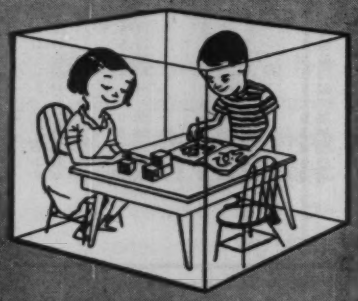
City	May	Mid May-Mid June	June	Mid June-Mid July	July	Mid July-Mid Aug.	Aug.	Mid Aug.-Mid Sept.	Sept.*	Mid. Sept.-* Mid. Oct.	Oct.	Mid. Oct.-Mid. Nov.	Nov.	Mid Nov. Mid Dec.
Atlanta	69.0/70.5	73.5/74.6	77.3/78.1	78.5/79.3	79.0/79.9	78.9/79.9	78.6/79.1	76.3/78.1	72.9/75.4	68.2/70.2	62.3/63.8	56.6/58.2	51.1/52.7	46.6/48.4
Baltimore	63.4/64.6	68.2/69.5	72.5/73.8	75.2/76.6	76.2/77.5	75.5/77.3	73.6/75.7	71.1/73.3	67.1/69.4	62.2/64.4	56.4/58.3	50.9/52.6	45.6/47.0	40.2/42.0
Birmingham	68.4/70.2	72.4/74.5	76.8/78.1	78.4/79.7	78.9/80.0	79.0/80.3	78.5/79.8	76.6/78.5	73.3/75.6	68.5/70.7	62.2/64.2	56.2/58.5	50.7/53.2	46.5/48.9
Boston	56.7/58.4	56.8/58.6	66.3/68.1	69.6/71.1	70.2/74.1	72.1/73.4	70.9/72.1	67.6/69.2	63.3/65.4	58.9/61.0	54.2/56.2	49.3/51.3	43.6/45.6	36.8/39.2
Chicago	57.9/60.5	63.1/66.1	68.0/71.2	71.6/74.0	73.7/75.1	73.8/75.4	71.7/72.0	68.8/70.7	64.5/66.7	59.3/61.7	52.8/55.3	45.9/48.6	38.6/41.5	31.2/35.0
Cincinnati	61.5/64.0	65.2/67.0	71.2/73.0	73.4/75.2	74.1/75.8	73.9/75.7	72.5/74.4	70.2/72.1	66.5/68.4	61.2/63.3	55.9/57.1	48.6/50.9	42.0/44.5	35.9/39.1
Cleveland	57.9/60.3	63.5/65.7	68.2/70.2	71.2/73.0	72.7/74.2	72.5/74.2	70.9, 72.7	68.5/70.6	64.7/67.1	59.5/61.8	53.5/55.6	47.1/49.3	40.5/42.7	34.3/37.2
Dallas	72.6/75.0	77.2/78.8	81.1/82.2	83.3/84.8	84.5/86.4	85.6/87.3	85.1/86.7	82.3/83.9	78.1/79.7	73.8/75.1	68.5/69.4	61.4/63.1	54.3/56.7	49.9/52.3
Denver	55.2/57.4	60.0/62.1	65.4/67.5	69.7/71.5	72.1/73.7	72.5/74.0	71.8/72.2	67.3/78.6	62.2/63.4	56.7/58.3	50.8/52.8	44.5/47.2	38.0/41.4	33.5/36.7
Detroit	56.5/58.7	62.3/64.4	67.3/69.9	70.6/72.1	72.5/73.5	72.3/73.6	71.0/72.5	67.5/69.5	63.0/65.6	57.8/60.2	51.9/54.1	45.8/47.9	39.2/41.1	32.9/35.3
Kansas City	64.6/66.4	69.4/71.2	74.2/76.0	78.0/79.6	80.0/81.5	80.2/81.8	78.4/80.1	74.6/76.6	69.7/71.9	64.4/67.0	58.1/61.2	50.7/53.9	42.6/45.9	36.7/40.1
Los Angeles	61.4/62.8	62.5/64.0	63.9/65.4	65.4/67.0	66.9/68.4	67.5/68.9	67.4/68.6	66.8/68.1	65.9/67.3	64.4/65.9	62.7/64.2	60.5/62.1	57.9/59.8	56.5/58.2
Minneapolis	57.2/60.2	62.2/64.9	66.6/69.1	70.3/72.5	72.9/74.9	73.2/75.0	70.8/72.3	66.3/68.4	61.0/63.6	55.5/58.3	49.8/51.7	40.4/44.5	30.9/36.0	24.5/28.1
New Orleans	73.8/74.9	77.0/78.1	79.9/80.9	81.0/81.9	81.4/82.3	81.8/82.7	81.8/82.7	80.8/81.9	78.5/79.7	75.1/76.5	70.5/71.9	64.6/66.8	59.0/61.5	56.0/58.5
New York	60.6/62.1	65.9/67.5	70.4/72.2	73.6/75.0	75.2/76.3	75.1/76.3	73.6/74.9	71.0/72.5	67.4/69.0	62.7/64.3	57.0/58.6	51.8/53.2	46.5/47.9	40.2/42.3
Philadelphia	62.3/64.0	67.5/69.2	71.5/73.1	74.1/75.4	75.8/76.6	75.1/76.3	74.5/73.3	72.1/70.6	66.8/68.5	61.6/63.5	55.6/57.6	50.3/52.3	45.3/47.2	39.9/42.0
Pittsburgh	58.7/60.9	63.5/65.8	67.4/69.7	70.2/72.0	71.4/72.8	71.0/72.4	69.3/70.9	67 2/68.9	64.0/65.9	58.8/60.9	52.0/54.4	46.2/48.2	40.3/42.0	34.0/36.4
St. Louis	64.0/66.6	68.7/71.5	73.5/76.2	76.9/79.0	78.7/80.2	78.5/80.1	76.7/78.5	73.6/75.6	69.1/71.2	64.0/66.3	58.1/60.5	51.0/53.9	43.6/46.9	37.6/41.2
San Francisco	55.9/57.4	57.5/59.1	58.8/60.5	59.6/61.0	59.7/60.9	59.5/60.7	60.1/61.2	60.9/62.2	61.3/62.8	60.4/62.0	58.5/60.2	56.4/57.9	53.8/55.0	50.7/52.3
Seattle	54.2/56.3	56.9/58.5	59.3/60.4	61.7/62.7	63.6/64.6	63.8/65.0	62.7/64 1	60.8/62.0	58.0/59.0	54.8/56.1	51.0/52.5	41.8/43.8	43.1/44.5	41.0/42.4

* Ranges for Sept. and Mid. Sept.-Mid. Oct. published March 24 issue for all cities except Baltimore, Cleveland and Philadelphia were actually for Oct. and Mid. Oct.-Mid. Nov. respectively. Correct ranges for these 30-day periods are shown here.

How to Fire-Proof Children

surround them with

PERLITE



CONCRETE AND PLASTER

Test after test has shown that pound for pound and inch for inch perlite insulating concrete roof decks and perlite walls are unsurpassed for fire-safe, low cost school construction. Perlite is less than 1/10 the weight of sand, gives plaster and concrete 4 to 20 times greater insulation. Perlite adds inherent fire-proofing qualities. Insurance costs are reduced immediately.

Write for complete information on the money-saving, fire-proofing and insulating features of perlite. Please use this coupon.

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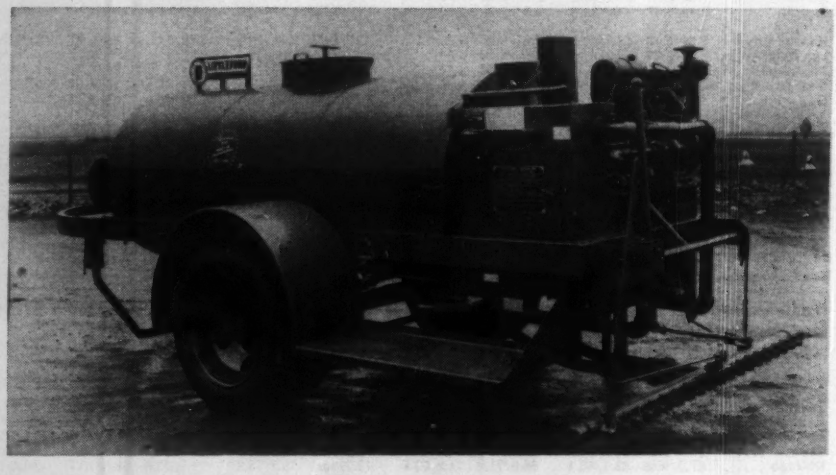
NEW PRODUCTS

Skis and Cylinders Speed Grading Work

An improved version of an underbody truck grader for maintaining secondary gravel roads is reported to have a positive anti-chatter moldboard.

The outstanding advantage claimed for this grader is its higher operational speed of 6 to 15 mph. The manufacturer claims that with such speeds the maintenance cost per mile can be lowered 30 to 40% since more miles of road can be maintained with fewer machines and operators.

The higher speeds are made possible by levelizing skis located behind and near each end of the moldboard. These skis and the hydraulic vertical supporting cylinders are said to oppose any tendency for the blade to chatter by absorbing the bounce transmitted by truck springs and tires as well as shocks from the road. For example, when dips in the road surface are encountered, the skis exert an upward force on the moldboard, keeping it in

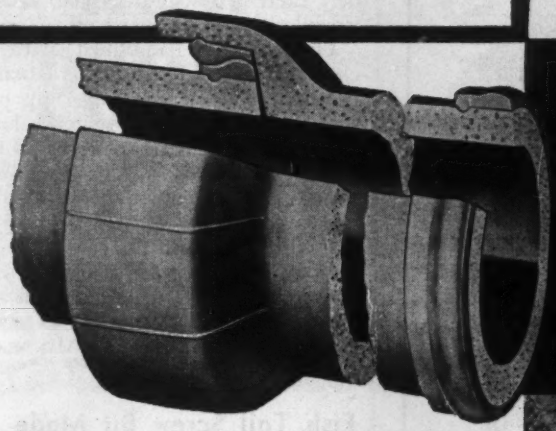


Spray Tank Has Circulating Spray Bar

The Model 101 utility spray tank has been redesigned for more efficient spraying of asphalt, tar, emulsions, cut-back or road oils. The spray tank now has an improved mechanical type circulating spray bar, with positive acting nozzles. It is possible to spray with either half of the new bar or any desired length and it can be furnished in both a shifting and nonshifting type—the shifting type also includes a raising and lowering feature. The unit has the 12-ft bar for small jobs, a hand spray attachment for patch work and a pouring pot outlet for crack filling and patch work. The 101 is made in two-wheel trailer models of 400 and 600-gal sizes, four-wheel trailer sizes up to 1,250 gal and truck-mounted sizes with capacities up to 1,000 gal. Littleford Bros., Inc., 457 E. Pearl St., Cincinnati 2, Ohio.

It's Here

the tightest, fastest-working joint ever developed for bell-and-spigot Clay Pipe!



New Wedge-Lock* by ROBINSON

PERMANENTLY BONDED DOUBLE-BALL JOINTS ON BELL AND SPIGOT "SNAP" TOGETHER FOR A PERMANENT, LEAK-PROOF SEAL!

Soon anyone will be able to make perfect Clay Pipe joints — easier and faster than ever before! Installing Wedge-Lock is simply a matter of lubricating the plastic joints with water, graphite solution, or Robinson's special adhesive sealant — and pushing them together. The "double-ball" type joint locks pipe in place . . . and is permanently *root-proof* and *infiltration-proof.*

This new pipe can be installed not only in regular house-to-sewer lines, but inside plastered walls and under basement floors. For inside-the-house installations, where "head" pressures are encountered, Robinson's special adhesive sealant is recommended. It softens the two jointing surfaces, welding them into a single, solid ring.

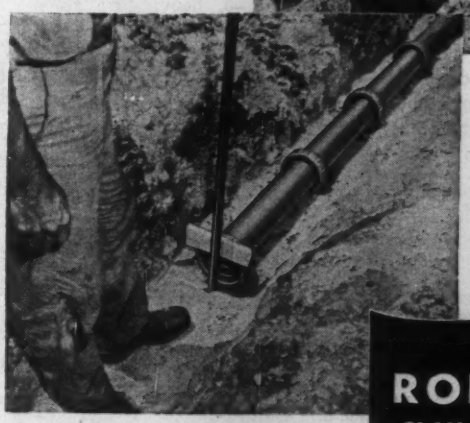
This new polyvinyl plastic joint, combined with never-wear-out vitrified clay, will form the *perfect* team . . . pipe that can be installed in seconds to last for generations!

A complete line of matching Wedge-Lock Fittings is available.

* T.M. Registration Applied For. Patents Pending.

Just paint the bell joint with lubricant . . .

Paint the spigot joint the same way . . .



Push the pipe together . . . the joint is complete!

THE ROBINSON CLAY PRODUCT CO.
ESTABLISHED 1856
AKRON 9, OHIO

WRITE FOR the new Wedge-Lock Clay Pipe Bulletin, a four-page file-sized brochure with complete, advance information on this new product. Address: The Robinson Clay Product Company, 65 W. State St., Akron 9, Ohio.

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You DO Have a Choice!

you can select from the Complete Line of

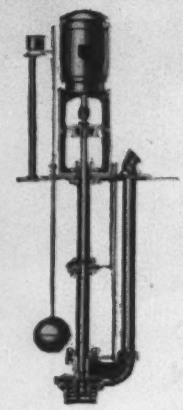
YEOMANS

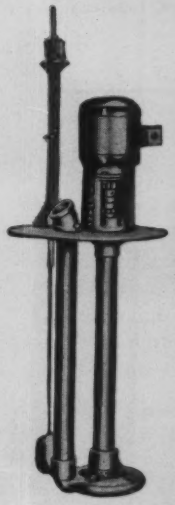
Vertical Wet Pit Pumps

the one that exactly meets your need for Building and Industrial Use

Series 3000 Bilge or Sump Pump for solids-free liquids from drainage and seepage, and industrial process wastes. LUBRI-VAC® System standard on all units increases normal life as much as 12 times—eliminates bearing scoring.

This heavy-duty wet pit pump is supplied as a complete unit including pump casing, impeller, shaft, suspension and discharge pipes, thrust bearing and flexible coupling assembled on a suspension plate with a catch basin or sump cover, with motor and automatic control equipment. Normally furnished with standard float and stand, but special automatic controls supplied when specified. Gravity or force feed automatic or non-automatic lubrication as required. Capacities from 15 g.p.m. to 1200 g.p.m.; heads to 75 ft.

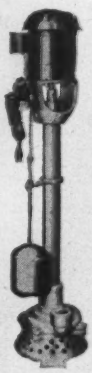




Series 3100 Bilge or Sump Pump—Top Suction Type. For homes, residential buildings, industrial plants, sewage and water treatment plants, recreation parks, pools and similar applications.

Meets the need for a moderate price pump of heavy duty construction for capacities to 120 g.p.m. and heads to 46 ft. Designed and built to Yeomans strict engineering standards with self-adjusting flexible coupling, liberal size stainless steel true running shaft, renewable sleeve guide bearings and bronze impeller with large water passages; balanced hydraulically and mechanically. Duplex sets with interchanger which divides work between pumps is recommended for longer life and emergency use.

"Drain-Dri" Sump Pump for buildings and industrial use. Built like a heavy-duty Yeomans municipal pump. Hand finished, balanced, non-clogging impeller passes any trash which goes through the screen. Extra large stainless steel shaft is highly polished, turned and ground. Float switch actuated by heavy copper float with guided float rod. Large area, heavy cast iron screen. Permanently aligned drip-proof ball bearing motor 1750 r.p.m. 60 cycle or 1450 r.p.m. 50 cycle. Can be supplied with diving bell for rugged underground duty. Sump depths from 2 ft. to 10 ft. Capacities to 85 g.p.m.; heads to 28 ft.



Call your local Yeomans representative listed in the Yellow Pages of your telephone book or attach coupon to company letterhead and mail direct.

For more information on these pumps or other Yeomans products see Sweets' Architectural and Industrial Construction Files.

(R) Registered Trade Mark.

YEOMANS Brothers Company

1999-1 No. Ruby Street, Melrose Park, Ill.

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☐ "Drain-Dri" Sump Pump

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Company.....

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NEW PRODUCTS

a level plane. Material rolled along by the moldboard fills in the dips and holes. Conversely, when the moldboard strikes humps, the vertical cylinders exert a downward force, causing irregularities to be sliced off.

Operation is simplified with an electrical-solenoid system for actuating the hydraulic valves. Finger tip pressure on electrical switch levers mounted on the dash panel is all that is needed for controlling the moldboard. It can be raised, lowered, tilted end to end and adjusted properly to the ski from within the cab. Of equal importance is that the two skis always stay parallel to the truck through a tie rod arrangement. LULL ENGINEERING CO., 7700 CEDAR AVE. S., MINNEAPOLIS, MINN.

Fish Tail Screw Bit Made In 2½ to 10-in. Diameters

The Pengo fish tail screw bit, a new addition to a line of earth boring tools, is available in ten sizes of drill heads ranging from 2½ to 10 in. in dia for boring to depths of approximately 300 ft.

The bit is designed for use with any make of continuous helix type auger for vertical or horizontal drilling of shot holes, wells, or any other purposes for which small diameter holes are required.

The screw bit attaches by means of a hexagonal or square shank, or a fitting that welds directly to the bottom of the flight so that any type of flight may be fitted. The bits are said to be economically priced and reportedly will drill rapidly through sandstone, limestone, shale and any material other than solid hard rock. PETERSEN ENGINEERING CO., SANTA CLARA, CALIF.

(*New Products continued on page 90*)

NEW POWER PACKAGE in dramatic debut!

AiResearch Turbocharger makes major boost in horsepower on huge Caterpillar D9 diesel tractor!

MIGHTIER THAN EVER BEFORE, the new giant Caterpillar D9 Tractor equipped with a small but potent AiResearch Turbocharger pushed record tons of dirt during tests at Proving Grounds and in the field. Application of this Turbocharger to these big tractors increased their original horsepower to their present brawny rating.

The Caterpillar Tractor Co. pioneered the installation of AiResearch Turbochargers as standard equipment on production machinery...with exciting results! Never before in earthmoving history has such a small, light power package provided such a tremendous increase in power ...*and with no additional fuel cost!*

In addition, the Turbocharger quiets the engine better than any known muffling device without any of the loss of power caused by mufflers!

The new Turbocharger, reflecting more than a decade of leadership in the development and production of radial turbines and compressors, has had more than 25,000 hours of laboratory and field testing. It again demonstrates the ability of AiResearch to produce small packages that do big jobs for industry. Your inquiry as to its adaptation and application to your equipment is invited.

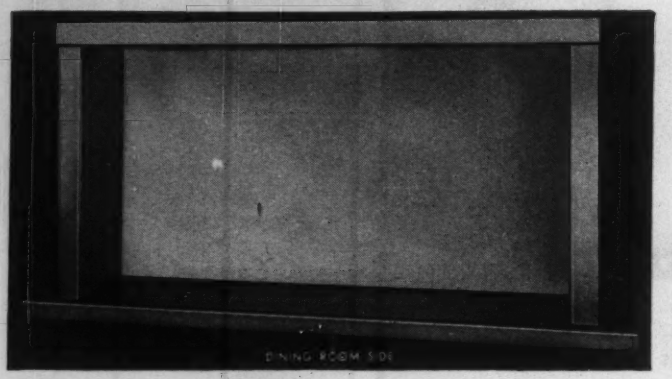
THE GARRETT CORPORATION

AiResearch Industrial Division

9225 Aviation Blvd., Los Angeles 45, Calif.

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND RELATED MACHINERY

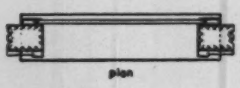
Peelle pass windows

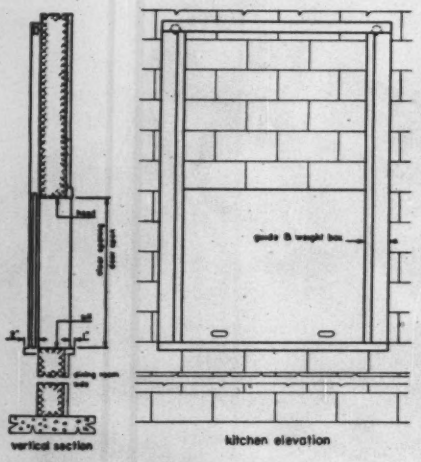


ease service

between kitchen and dining room in many prominent schools

The standard Peelle pass window unit is used between kitchen and dining room and other similar locations. It consists of an integral door and frame. Special extended counter sills will not be furnished except when architectural drawings indicate specifically where this is to be done.





Specifications should read: Furnish only (installation by others) standard Peelle pass window which shall be completely assembled with steel guides, integral frame and trim. The door panel shall be connected by cable chain to the door counterweights. Standard sill shall be furnished (if this is the case). If a cover is wanted on kitchen side to cover space between rails, specifications must call for it. Specify finish (i.e., prime, baked enamel or stainless).

THE PEELLE COMPANY

47 STEWART AVENUE, BROOKLYN 37, N. Y.

PEELLE MOTORSTAIRS • FREIGHT ELEVATOR DOORS • DUMBWAITER DOORS • INDUSTRIAL DOORS

Sweet's

NEW PRODUCTS

Plastic Coated Conduit and Tubing Resists Corrosion

Polyvinyl chloride-coated rigid conduit and electrical metallic tubing are said to be extremely resistant to corrosion. The coated conduits are recommended for installations in areas subjected to unusual atmospheric conditions such as in paper, soap, fertilizer, industrial inorganic and organic product plants, and in canneries, meat packing and food processing plants.

The extruded seamless coatings reportedly provide uniform, non-porous protection over the entire length of the raceways, and effectively resist the action of grease and oils, and organic solvents. Further, they are said to offer excellent resistance to sunlight and weathering. Tests conducted by the company indicate that 30 or 40 years' service will not age the coating significantly.

According to the manufacturer, the

(*Continued on page 95*)

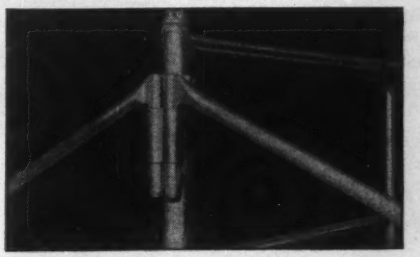
Work Shoes and Boots Get Protection With Silicones

Water repellency, resistance to absorption of chemicals and filth and longer life are claims made for a new line of Sylflex tanned shoes and boots. Sylflex is a silicone treatment said to make leather permanently water repellent and lengthen the life of shoes. The work shoes with Sylflex are being offered initially in two styles: a 6-in. shoe and an 8-in. outdoorsman's boot. The protection is given by applying silicones to the leather while it is being tanned. Each leather cell is given a water repellent covering, leaving air spaces between cells to allow the shoe to "breathe." Red Wing Shoe Co., Red Wing, Minn.

BIGGEST NEWS IN SCAFFOLD HISTORY

NOW—FOR THE FIRST TIME—EVERY PANEL, EVERY BRACE, EVERY SINGLE COMPONENT PART OF UNIVERSAL SCAFFOLDING

No More Pitting—Gone are the curses of rust-pits that eat into scaffold steel. Construction men and mason contractors well know how these rusted, rough surfaces slow down erecting and dismantling. Now, Universal's protecting galvanized surface assures faster operations and lowers maintenance costs.



Rust-Free, Lubricated Surfaces—The smooth surface that galvanizing provides, acts as a lubricant when fitting braces and connections. Further, mortar won't cling as readily to cleaner-surface zinc galvanizing—and your Universal Scaffold will constantly work better to give you more job profits.

Send for free Literature on:
EZEBILT & LADSCAF Panel Scaffolding
AMERICAN-TUBULAR Elevating Towers
AMERICAN-UNIVERSAL Bleachers

THE MOST WANTED IMPROVEMENT IN THE INDUSTRY! LUBRICATING GALVANIZED SURFACE, THAT PROTECTS AGAINST RUST, SPEEDS UP ALL YOUR SCAFFOLD WORK.

Here, at last, is the wonderful result of long experimental research, to bring to scaffold users all the benefits of zinc galvanizing—at no increase in cost. Universal Manufacturing Corporation, world's largest producer of steel-panel scaffolding, is now applying on every single component of Universal Scaffolding, a perfected zinc-galvanizing that provides a clean, smooth, rust-preventive and lubricative surface.

At last, RUST, the age-old curse of the scaffold business is satisfactorily disposed of—once and for all.

The harmful effects of rust and corroded rough surfaces will no longer slow down your scaffold erection and dismantling. And, you can count on substantial reductions in the costly recurring expenses of maintaining and reconditioning your scaffold. Your scaffolding will work faster, look better on the job, and last longer. This important new development means that where profits depend on fast, efficient scaffolding, ***you can now count on more profits.***

We welcome inquiries from scaffold users in sea-water coastal areas, or in chemical installations, where corrosion is an important consideration.

INVESTIGATE TODAY! SEE YOUR LOCAL UNIVERSAL DISTRIBUTOR WHO CAN ARRANGE FOR IMMEDIATE DELIVERIES

Another "FIRST" by the Pioneers of the Only Automatic-Locking Brace—"Gravity-Lock"

UNIVERSAL MANUFACTURING CORP.

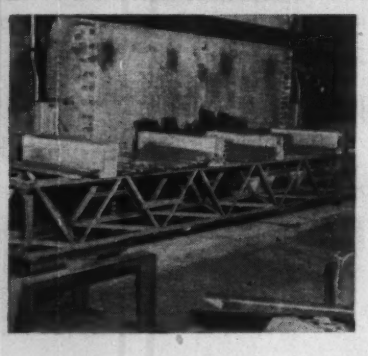
"World's Largest Producer of Steel-Panel Scaffolding"

ZELIENOPLE 3, PA.

REDUCE HANDLING COSTS...

the quickest way to

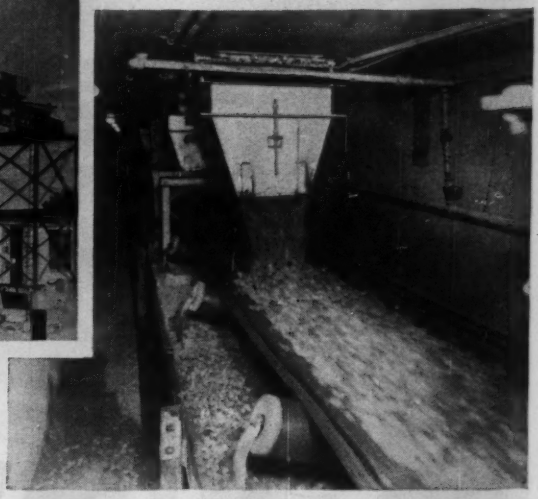
HELTZEL-OHIO INCLINED AND SHUTTLE CONVEYERS make the handling of vast amounts of materials fast and economical. Before you buy any equipment let Heltzel-Ohio specialists look over your operation and estimate a complete modern day system.



GREATER STRENGTH for LONGER LIFE is the story behind Heltzel-Ohio's special A-frame. Fully stress relieved, most parts are fabricated at the factory under ideal conditions. Unitized, it sets up fast—will last longer.

Thoroughly proved under "back-breaking" loads, every Heltzel-Ohio conveyer section must pass rigid weight tests far in excess of anything it will ever have to carry in the field.

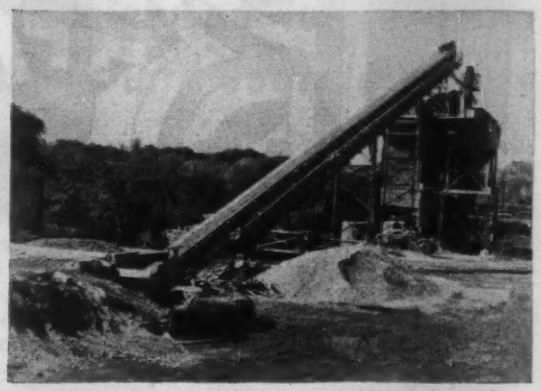
ECONOMICAL SMALL SPACE HANDLING is possible with the discriminate use of switchback conveyers. In a number of cases Heltzel-Ohio engineers have devised 180° or full switchbacks to get maximum use of the space at hand.



TUNNEL CONVEYERS feed from the bottom of the stockpile to cut handling to a minimum. Special Heltzel-Ohio tunnel gates make this system foolproof. Controlled from central panel.

Greater Profits

Heltzel-Ohio Custom Aggregate Handling Systems slash costs for both large and small operators!



ECONOMICAL HANDLING FOR SMALL OPERATORS is a Heltzel-Ohio specialty. Our engineers have cut costs for hundreds of small tonnage operators with simplified, inexpensive, easily controlled systems.

The one place in your operation that you can cut costs without cutting quality is the handling of materials. The research of one leading publication pointed up the fact that 8 out of 10 contractors and yards could realize greater profits simply by bringing their handling equipment up to date.

In a recent check one operator looked over his figures and found it cost him in excess of 28 cents to handle the materials needed for a yard of concrete. He called in Heltzel-Ohio engineers who devised a system that cut this cost to approximately 4 cents a yard. The savings quickly paid for the equipment and now enables him to sell top quality at competitive prices and with much faster service.

Consider your operation. Let a Heltzel-Ohio man show you how modern equipment will pay for itself in short order. How it will put you in the best competitive position possible. And when you think of materials handling, remember Heltzel-Ohio engineers are specialists —designing and building materials-handling equipment specifically for the concrete industry. Get the last word from those who know. Send in the coupon today!

SPECIALISTS IN HANDLING SYSTEMS FOR THE CONCRETE INDUSTRY

HELTZEL *Ohio* **HANDLING SYSTEMS**

Heltzel-Ohio Handling Systems Div. 28000 Thomas Road
Heltzel Steel Form & Iron Co., Warren, Ohio

I'm interested in reviewing my handling operation. I would like to have a Heltzel-Ohio engineer look it over at no obligation.

Name_____

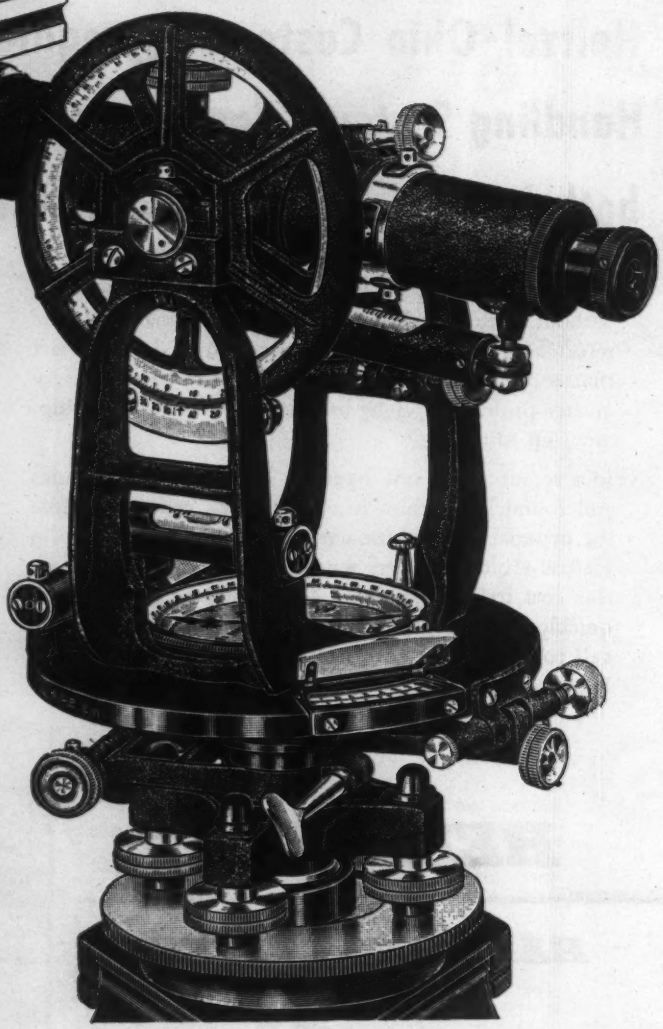
Company_____

Address_____

City_____ State_____

7,000 ITEMS A KEY TO K&E LEADERSHIP

Drafting, Reproduction, Surveying,
Optical Tooling Equipment and Materials
Slide Rules Measuring Tapes



• **Since 1867 engineers, scientists, designers, surveyors, draftsmen have relied on K&E as the foremost, most progressive, and most complete source of supply for the tools, equipment, and materials they work with. When you buy, think first of K&E, headquarters for 7,000 items. For example . . .**

K&E PARAGON® SURVEYING INSTRUMENTS

Superb optics. Fully achromatic.* Stability of adjustments. Dependable precision. Rugged construction. These are among the essentials built into K&E PARAGON Transits and Tilting Levels. They combine to give the performance for which K&E PARAGON instruments are famous, through long years of service, under all conditions, in all climates.

*The K&E Fully Achromatic Optical System includes an achromatic eye lens in addition to the achromatic objective lens that is usual in fine surveying instruments.

KEUFFEL & ESSER CO.

EST. 1867

New York • Hoboken, N. J.

Chicago • St. Louis • Detroit • San Francisco • Los Angeles • Montreal
Distributors in Principal Cities

polyvinyl coating has a tough, durable finish that never needs painting and is easy to clean. It has an average tensile strength of 2500 psi with resistance to tearing and abrasion.

The coated rigid conduit is available in sizes from ½ to 3½ in. and in EMT in sizes from ½ to 2 in. CONSTRUCTION MATERIALS DIV., GENERAL ELECTRIC CO., BRIDGEPORT 2, CONN.

Heavy-Duty Rock Drill Is Really a Four-in-One Tool

A heavy-duty, minimum-weight rock drill, designated as Model DS-38, is said to be actually a four-in-one tool. With the addition of a few accessory parts, it can be converted, without dismantling, from blower type to blast type, or to wet type with manual water valve or to wet type with auto-water valve. This makes the tool suitable for many drilling conditions.

Three rotation speeds—average, fast or slow—can be furnished, and raised center grip and raised tee handles are optional. Further, five sizes of collar shank chucks are available.

An outstanding feature is said to be the employment of pneumatic pawls in the rotation ratchet instead of the commonly-used mechanical pawls. These are "pushed" out of engagement with the ratchet teeth at the time the ratchet starts to turn to eliminate rubbing wear on the pawls.

Other design features include involute splines, phosphorus bronze air and water tubes, pressure built-in lubricator, chrome-plated cylinder bores, rocket valve with double trip ports for positive piston hammer action.

Net weight of the DS-38 with 1-in. chuck is 40 lbs; length is 21 in. With a ⅞-in. chuck, the drill weighs 38 lb and is 20 in. long. Width is 17¼ in. and depth, 5 in. DAVEY COMPRESSOR CO., KENT, OHIO.

Nylon and Vinyl Tarpaulins And Tents Are Lightweights

A line of tarpaulins and coverings of all shapes and sizes, plus a complete line of tents is made from a new lightweight material which incorporates the use of nylon and vinyl plastic film.

Among the features reported for the material are exceptional tear strength, easy storage, waterproofness, rot and mildew resistance and sun-fast colors. This material is said to have met most specifications of the armed services; all seams are electronically welded, not just sewn. FELLOWCRAFT ENGINEERING, INC., 270 JELLIFF AVE., NEWARK 8, N. J.

(*New Products continued on page 96*)

Get ALL the Advantages of Latex Flooring for Wearing Surfaces and Underlayments with Flintkote's PERMASETS*

As you know, thin mastics must have extra toughness and strength without being brittle. To withstand impact on flooring surfaces.

In addition, you want smooth evenness. Resilience. Traction. And comfort underfoot.

Use scientifically formulated Permaset Latex Binder Mastics to meet all these requirements *exactly*. Permaset Mastics provide unique properties not found in other flooring materials.

You can have mixes designed especially for underlayments. To make ideal leveling courses for preparing your floors for tile or other decorative covering.

And you can have mixes for finish floors, including terrazzo, in several colors. With high resistance to wear, as well as to various oils, greases, acids and alkalies.

*Reg. U. S. Pat. Off.

A gallon of the selected latex and a bag of the selected premix constitutes a unit mix. Use over wood, concrete or other firm base.

Send for data giving all the various formulations and directions for applying. Or ask a Flintkote Representative about special flooring problems.

Liquid latex is mixed with dry, premixed filler for the type of mastic and color you need. Result: a superior trowel-applied Latex Mastic . . . Permaset.

FLINTKOTE

THE FLINTKOTE COMPANY, *Industrial Products Division*, 30 Rockefeller Plaza, New York 20, N. Y.

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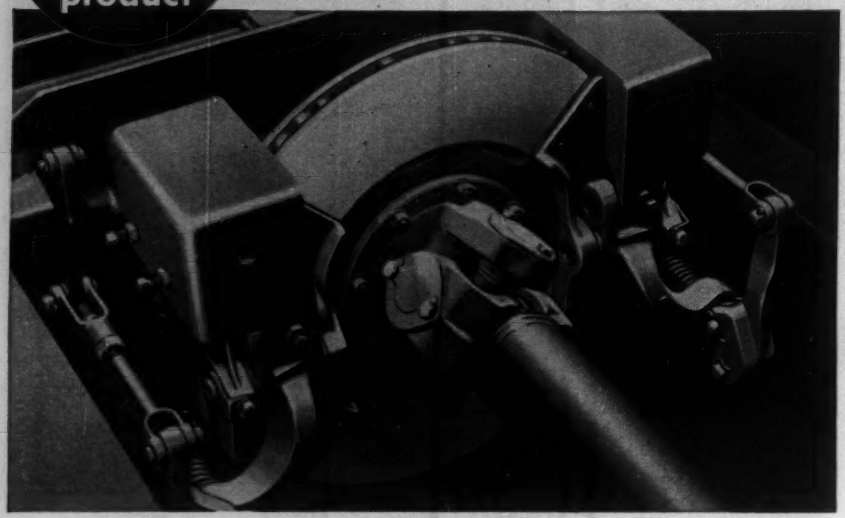
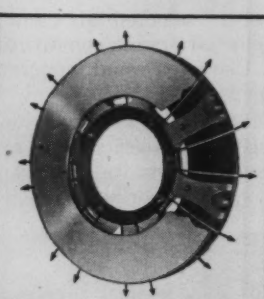
an ACCO product

It Pays to Specify TRU-STOP Brakes



because they give you Real Emergency Braking...Smooth, Positive Stops...Safe Parking... and Lower Service Costs



Longer Lining Life

• The terrific heat generated in braking cuts lining life. TRU-STOPS quickly dissipate this heat. Most of the disc is exposed to the air even during braking. And a cooling jet of air circulates through the disc, prolongs lining life.

Real Emergency Braking. TRU-STOPS *are real emergency brakes—not just "parking brakes."* They serve as auxiliary brakes on long down-grades and can bring the vehicle to a smooth, quick stop if service brakes suddenly fail.

In fact, TRU-STOPS can do this and more. They can handle the vehicle with safety so it can be removed from the road.

Smooth, Positive Stops. Pressure is in direct proportion to the pull on the brake lever. There is no dangerous self-energizing or "over-braking."

Safe Parking. TRU-STOPS hold on grades—prevent "parking brake" accidents.

Lower Service Requirements. TRU-STOPS are mounted directly on the drive shaft. Their simplicity of design and accessibility reduce maintenance requirements. Relining or adjustment is a simple job for any mechanic with ordinary tools. It is not necessary to drop drive shaft.

Specify TRU-STOPS for factory installation on your next vehicle.

This Booklet gives the complete story on TRU-STOP Brakes. Send for your copy today

ACCO

TRADE MARK

Automotive and Aircraft Division
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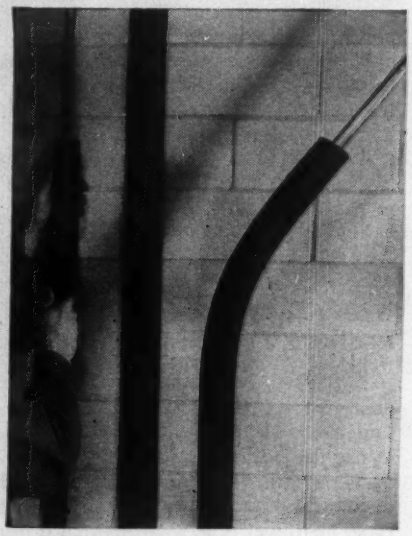


Foamed Insulation Developed For Dual Temperature Lines

A new foamed plastic pipe insulation has been developed for use on dual temperature lines to air-conditioning units.

Called Armaflex, the material is available in tubular form and can be slipped on pipes or tubing when the system is being installed. If the lines have been connected and tested, Armaflex can be cut to the desired length, slit longitudinally, snapped on the line, and the slit sealed with an adhesive which is available with the material.

Because it is a closed-cell foam highly resistant to the passage of vapors and air, it does not require a vapor barrier. It is also said to possess excellent insulating properties, the thermal conductivity of the material being .28 at 75 F or approximately the same as corkboard. It will withstand temperatures on dual-temperature lines or tubing from 32 to 200 F.

Other characteristics of the material include low air and water vapor permeability, low water absorption and good high temperature stability. It is self-extinguishing in that combustion ceases when there is no direct contact of the material with a flame. The ½-in. wall thickness of the material reportedly prevents condensation caused by climatic conditions normally experienced anywhere in the U. S.

Light in weight, and therefore easy to handle on the job, Armaflex is made in 6-ft lengths in four sizes to fit the sizes of pipe commonly used in dual-temperature heating and cooling system installations—⅝, ⅞, 1⅛ and 1⅜ in. ARMSTRONG CORK CO., LANCASTER, PA.

(*New Products continued on page 98*)

"OUR MITI-MITE SAVES US $8,780 PER YEAR"—

say STEFFAN BROTHERS of Carpentersville, Ill.

That's the record chalked up by this up-and-coming earth-moving contractor at the Meadowdale housing development near Elgin. "Our MITI-MITE® with trench hoe attachment has been averaging 400 feet a day digging a 30" trench from 5' to 8' deep. During the past year of operation, we saved $4.00 an hour for a total of $8,870.00 over competitive rental machines."*

P&H modern design adds up big savings. For instance, MITI-MITE has all-welded construction — *proved by P&H for over 20 years* to give you superior strength. As a crane it gives you a full 8-ton capacity to handle a wide variety of long- or short-boom jobs. Take the MITI-MITE anywhere; its rugged carrier is built for your roughest, toughest jobs.

And as far as maintenance costs go . . . they're the lowest in the business. The MITI-MITE is a real money-maker at a low price. See it yourself at your P&H dealer's. P&H Power Crane and Shovel Division, HARNISCHFEGER Corporation, Milwaukee 46, Wisconsin.

*User's statements are quoted from a certified Gould Report, available upon request. Ask us to send you Gould Report No. 5412. Or ask your P&H dealer.

HARNISCHFEGER

See your P&H dealer

"Your P&H Dealer has the experience, the organization and the facilities to serve you reliably in every way. He's ready to deliver the kind of on-the-ground service that keeps your jobs moving on schedule. Your P&H Dealer is tops in the business. Get to know him."

the **P&H** *Line*

Compare the Costs!

These 2 Booklets show that you can give communities more school facilities for their tax dollars — without sacrifice of safety, comfort, beauty, and longevity of service — when you plan their school buildings in wood.

**Comparative cost data developed by a nationally recognized firm of consulting evaluation engineers.*

TIMBER ENGINEERING COMPANY ENR-557
1319 18th Street, N.W., Washington 6, D. C.

Please send FREE copy of "Comparative Costs of Walls, Partitions, Roofs for School Buildings" and "School Buildings Your Tax Dollars Can Afford".

NAME.....

FIRM.....

STREET.....

CITY..... ZONE..... STATE.....

Vibrator Carrying Ring Also Stores the Flexible Shafting

A new heavy duty concrete vibrator, Model AG, has a 4½ hp, 4 cycle air-cooled gasoline engine and runs at speeds up to 9,300 vpm.

This vibrator has a combustion ring guard and handle around which the flexible shafting can be wrapped for carrying. It also protects the engine from damage if the vibrator should be tipped over. The engine is mounted on a 360 deg swivel to make it easier to operate over a wide area. An automatic centrifugal ball bearing clutch is standard equipment to ease starting the engine. If desired, the vibrator can be obtained with a rubber tired wheelbarrow base.

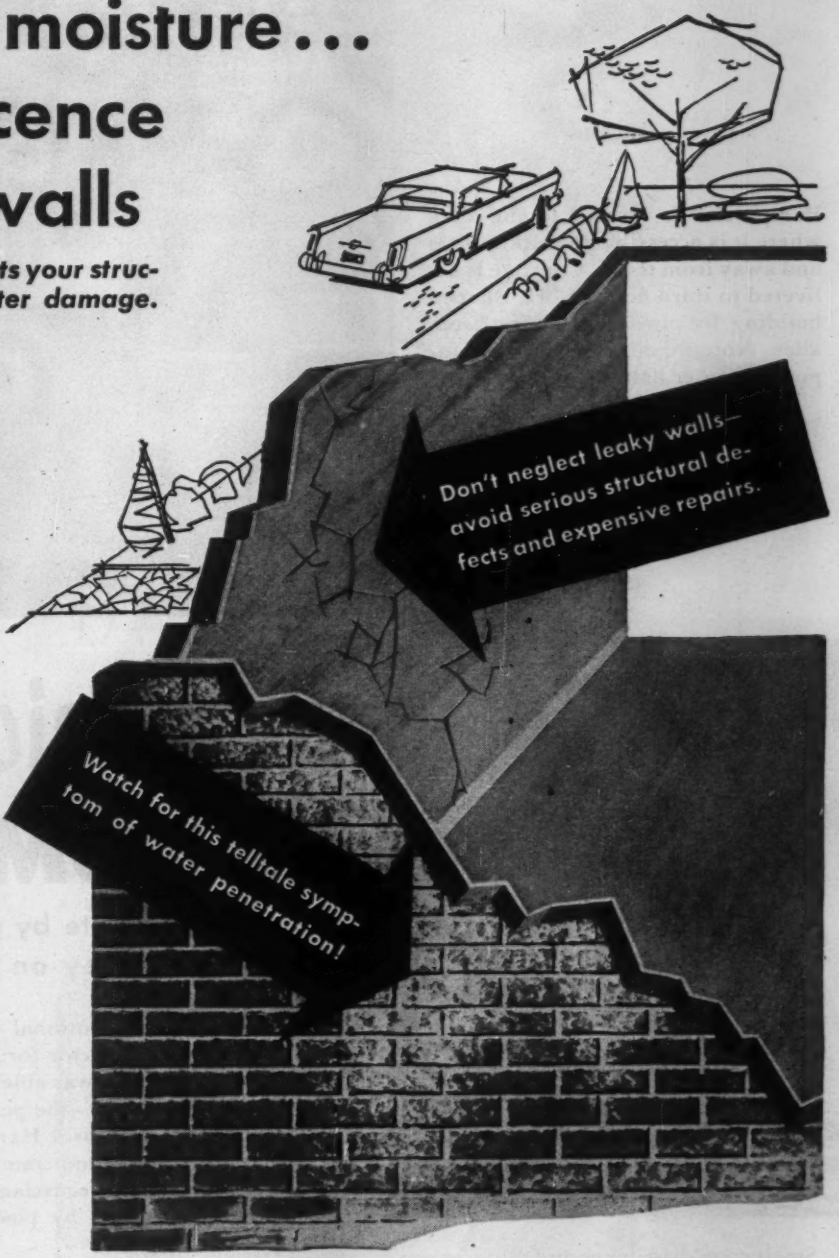
Reinforced ⅜ in. flexible shafting is used, and it can be obtained in lengths of 7, 14 or 21 ft. Combinations of these lengths can be attached to each other to give lengths up to 35 ft. A 2½ in. vibrator head with a hardened steel removable tip is standard on the machine. Additional heads which are interchangeable are 1⅝ x 10 in. and 2 x 10 in.

Wet rubbing or dry grinding of concrete can be done with the machine by removing the vibrator head and using an anglehead. The angleheads have an attachment so that water can be forced through the center of the grinding wheel on to the concrete for wet rubbing. Various discs and pads can be used for dry grinding. Stow Mfg. Co., 19 Shear St., Binghamton, N. Y.

DEHYDRATINE NO. 22

seals out moisture... stops efflorescence on masonry walls

Silicone base water repellent protects your structures from inside and outside water damage.


Don't neglect leaky walls—avoid serious structural defects and expensive repairs.
Watch for this telltale symptom of water penetration!

Dehydratine No. 22 is no ordinary "surface" repellent. It functions on the principle of "negative capillarity" *in depth.* The highly penetrating characteristics of Dehydratine No. 22 set up a valve-like action within the masonry that permits vapor to escape *outward,* but stops the capillary absorption of solid drops of moisture from passing inward.

Dehydratine No. 22 reduces soiling and discoloration

Dirt and soluble stains cannot enter the pores of masonry treated with Dehydratine No. 22. Thus foreign particles trapped on the surface are readily washed off by rain. Owners and operators of concrete or light-colored stone buildings find that this saves money by eliminating difficult and expensive cleaning operations. Since Dehydratine No. 22 is effective against "white bloom" or efflorescence, it preserves the original beauty of the exterior without changing the color or texture of the surface. It pays to protect your structures against *inside* and *outside* water damage with Dehydratine No. 22.

A Subsidiary of Sun *Chemical Corporation*

HORN

A. C. Horn Co., Inc.

Long Island City, Los Angeles, San Francisco, Atlanta, Houston, Chicago, Toronto

FREE INFORMATION

A. C. Horn Co., Inc.
Dept. H2-59, 10th Street & 44th Ave., L. I. C. 1, N. Y.

Please send me more information on Dehydratine No. 22.

Name_____

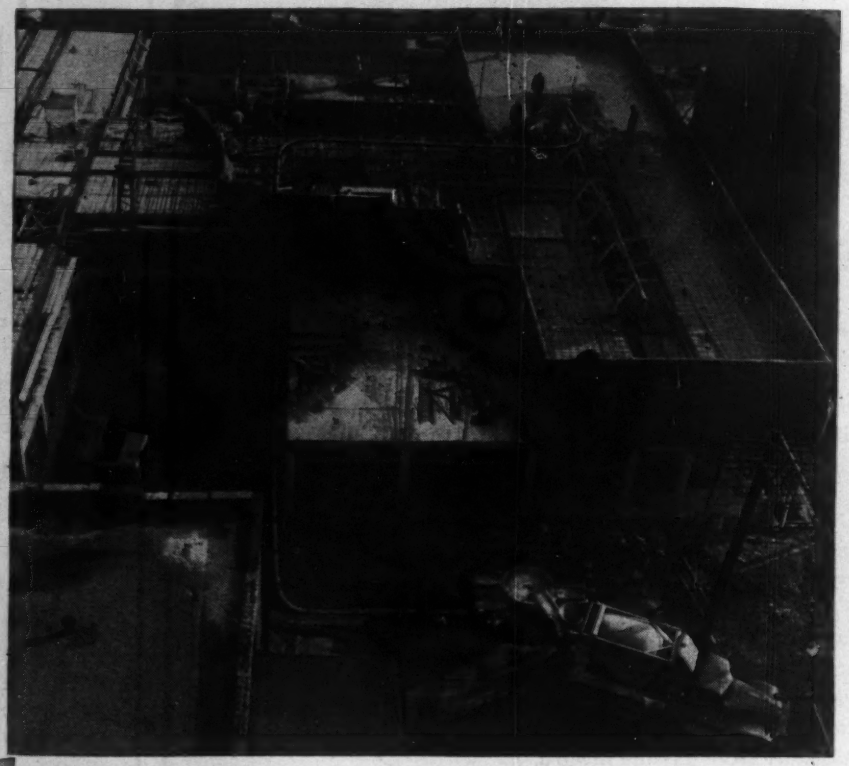
Company_____

Address_____

City_____ State_____

DIVISIONS OF SUN CHEMICAL CORPORATION

HORN • **HUDSON** • **WILLEY** (paints, maintenance and construction materials, industrial coatings) • **WARWICK** (textile and industrial chemicals) • **WARWICK WAX** (refiners of specialty waxes) • **RUTHERFORD** (lithographic equipment) • **SUN SUPPLY** (lithographic supplies) • **GENERAL PRINTING INK** (Sigmund Ullman • Fuchs & Lang • Eagle • American • Kelly • Chemical Color & Supply Inks) • **MORRILL** (news inks) • and **ELECTRO-TECHNICAL PRODUCTS** (coatings and plastics)



Pumpcrete® is located in the alley where it is accessible to truck mixers and away from traffic. Concrete is delivered to third floor of "H" shaped building by pipeline, 160 feet from alley. Note pipeline set in place for pour on other half of floor.

Small crew distributes and vibrates concrete in place. Note absence of cumbersome runways and buggies. Pumpcrete placed approximately 2200 yards of concrete for the building, averaging 15-18 yards per hour.

Reports: "nice going... with PUMPCRETE!"

concrete by pipeline saves time and money on new Chicago building

By eliminating conventional concrete-handling equipment—buggies, runways, lifts—contractor for this four-story "H" shaped structure on Chicago's North Side was able to place concrete at less cost, faster and better with Pumpcrete—the pump that delivers concrete by pipeline!

Construction supervisor Harold Arnold of Sumner Sollitt Company, Chicago, reported Pumpcrete eliminated expensive handling equipment. Iron workers, electricians and other trades were able to work on schedule, undisturbed by placing operations—"it's nice going with Pumpcrete."

The single Model 160 Pumpcrete was located in the alley to the rear of the building . . . out of the way of street traffic and easily accessible to truck mixers. This arrangement relieved traffic congestion and expedited over-all job progress.

Investigate the job-speeding, cost-cutting advantages of Pumpcrete on your next job. See your local Rex Distributor or write Chain Belt Company, 4633 West Greenfield Ave., Milwaukee 1, Wisconsin.

CONSTRUCTION REX MACHINERY

CHAIN BELT COMPANY

MEN AND JOBS

W. A. Johnson

Western Builders Organize New Group Called Beavers

The builders of most of the heavy engineered construction projects in the west have formed an organization known as the Beavers.

Embracing those active in the area west of the Mississippi, including Alaska, the Philippines and all the Pacific, its membership includes supply organizations, engineers, publishers, legislators and others, besides builders, who believe in the competitive contract system. Although primarily social in nature, the new organization will foster and promote the skill, responsibility and integrity of the construction industry.

Present plans call for annual meetings at which awards will be made to individuals and firms who have brought success and honor to the industry.

Serving as first president of the Beavers is William A. Johnson, chairman of the board of American Pipe & Construction Co., of Los Angeles, Calif.

Karl Terzaghi Is Honored By Engineering Societies

The annual award of the Engineering Societies of New England for 1955 was presented to Karl Terzaghi, Harvard professor of civil engineering and internationally recognized authority on soil mechanics.

A pioneer in the development and recognition of soil mechanics as a modern science, Terzaghi has been frequently cited for his contributions

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Masonry water repellents containing General Electric DRI-FILM silicones preserve the beauty and prolong the life of structures—old and new. A simple, inexpensive treatment retards spalling and cracking, controls efflorescence and keeps surfaces cleaner. And, of course, a water-repellent *exterior* means a dry *interior*.

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Ask your water repellent supplier about a treatment based on G-E DRI-FILM silicones! For the names of suppliers using DRI-FILM in their products, just write to General Electric Company, Section 155-1C, Waterford, New York. (IN CANADA, write to Canadian General Electric Company, Ltd., Toronto.)

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in that field. He was awarded the Normam Medal of the American Society of Civil Engineers three times, was presented the Brown Medal of the Franklin Institute and has received both the Desmond Fitzgerald Medal and the Clemens Herschel Award of the Boston Society of Civil Engineers.

Born in Czechoslovakia, Terzaghi was educated in Austria where he received his doctor's degree in civil engineering. During his varied and active career as engineer, consultant, teacher and writer, he has been associated with the construction of many projects both here and abroad, including hydro-electric developments in Austria, the Balkans and northern Russia, projects of the Bureau of Reclamation in the western part of the United States, irrigation projects in central Asia and dams and foundations in Europe and North Africa.

In addition to his academic work at Harvard, Terzaghi has also taught or lectured at the Turkish Engineering College and Robert College in Istanbul, the Technische Hochschule in Vienna, Massachusetts Institute of Technology and the University of Illinois. In 1939 he was the James Forrest Lecturer for the British Institute of Civil Engineers.

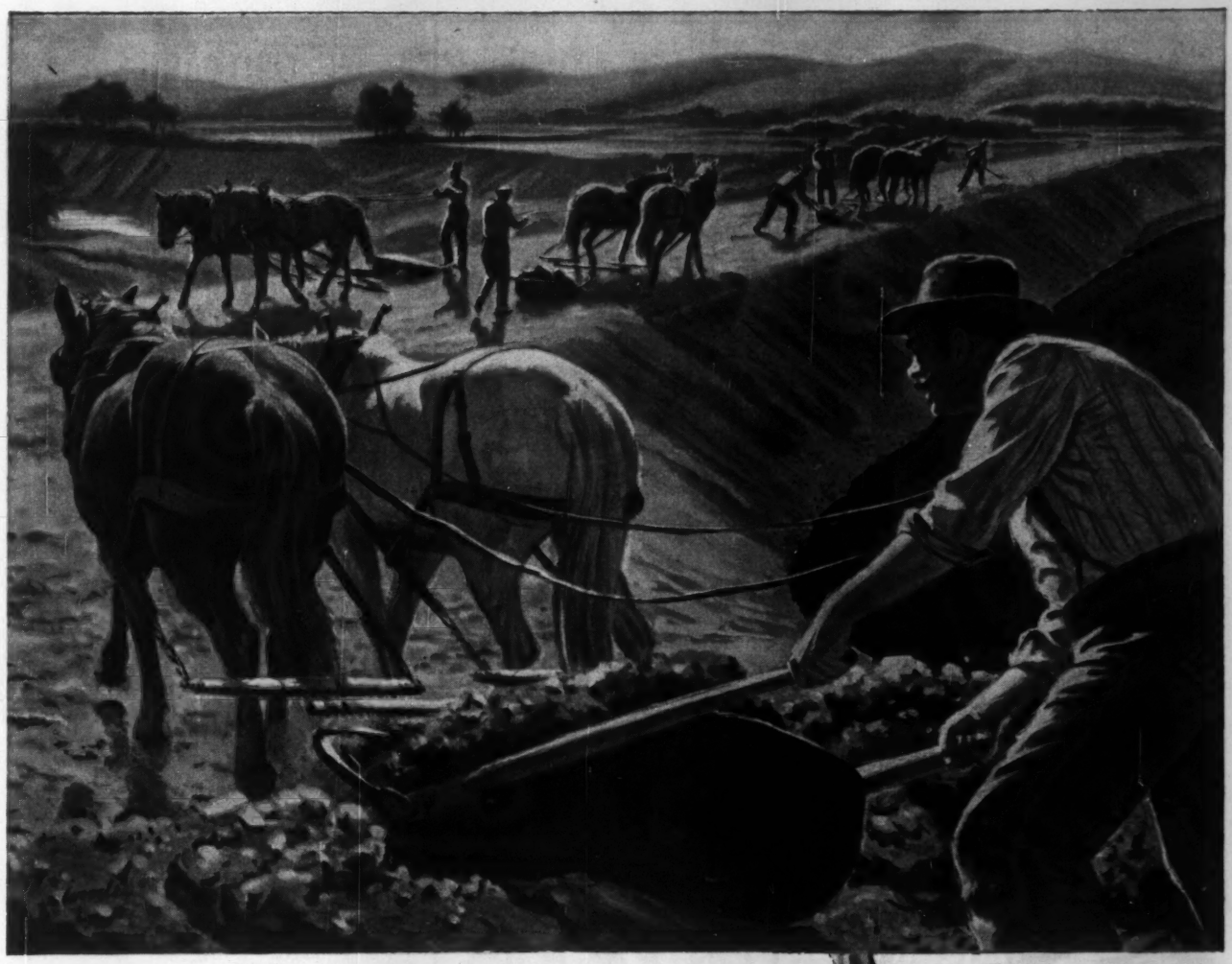
Terzaghi is a past president of the International Conference on Soil Mechanics and Foundation Engineering and is an honorary member of the American Society of Civil Engineers.

Men and Jobs Briefs . . .

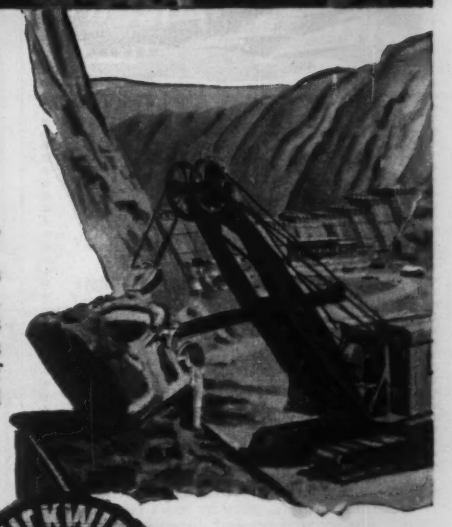
• **Associations**—The Pennsylvania section of of the American Water Works Association elects **Francis S. Friel**, head of the American Institute of Consulting Engineers, president . . . **A. Holmes Crimmins**, treasurer of Thomas Crimmins Construction Co., N. Y., succeeds **George F. Ferris** as head of The Moles . . . **Richard H. Frizzell** becomes president of Wire Reinforcement Institute, Inc.

• **Business**—Day & Zimmermann, Inc., Philadelphia engineers and constructors, elects **Theodore E. Seelye** president, succeeding **W. Findlay Downs** who's headed the company for 26 years . . . **Frank Sesler** is named a vice president of Ehrhart & Arthur, Inc., Los Angeles engineering and construction firm.

• **Honors**—**Ralph B. Wiley**, retired head of Purdue University's School of Civil Engineering and now a consulting engineer, is named Indiana Engineer of the Year.



no match for MUSCLES OF STEEL



America's towering dams stand as mighty monuments to the efficiency of modern excavating and earth-moving equipment. On these machines, *muscles of steel*—rugged wire rope—handle with ease and dispatch the tasks that once were back-breaking for man and beast.

Wherever big construction projects are under way, you'll find Wickwire Rope at work—helping to do a better, faster and more efficient job.

Same way—in the mines and quarries ...in the oil fields and logging camps... with the fishing fleets and in materials handling. Here, too, Wickwire Rope has won outstanding preference because of its proved durability and demonstrated reliability and economy.

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2696

GAHAGAN ANNOUNCES

some recent users of its

GEOPHYSICAL SURVEYS

LOCATION	CLIENT
Shelton Well Field	Bridgeport Hydraulic Company
The Connecticut Expressway	Ammann & Whitney, Engineers
Casco Bay Power Project	Central Maine Power Company
Delaware River Power Project	Jackson & Moreland Co., Engineers
Southeast Expressway, Mass.	Massachusetts Dept. of Public Works
Narrows Bridge Site, Brooklyn & Staten Is., N. Y.	Ammann & Whitney, Engineers
125th Street Bridge Site, N. Y. C.	Ammann & Whitney, Engineers
Narragansett Bay	New England Power Service Company
Baker River (Wash.) Hydraulic Development	Stone & Webster, Engineers
St. Lawrence Power Project	Sanderson & Porter, Engineers
Massachusetts Turnpike	Howard-Needles-Tammen & Bergendoff, Engineers
Garden State Parkway, New Jersey	Goodkind & O'Dea, Engineers
The Connecticut Expressway	Loomis & Sullivan, Engineers
The Connecticut Expressway	Knappen-Tippetts-Abbett-McCarthy, Engineers
Portland, Pa. Power Plant	Metropolitan Edison Company

Gahagan—a leader in hydraulic dredging since 1898—now offers engineers enormous savings in time and money when planning sites for highways, dams, power plants and other heavy construction. Gahagan seismic crews cover the country; quickly give you an accurate and continuous profile of bedrock, both on land and under water. For full details, write, wire or telephone Ken Sandbach, Vice President, Geophysical Survey Division, Gahagan Construction Corp., 90 Broad St., New York 4, N. Y. Telephone: Whitehall 3-2558.

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OBITUARIES

James R. Maccoun, 26, a civil engineer with A. Teichert & Son, Inc., Sacramento, Calif., was killed April 28 in an automobile accident near Sacramento. He was graduated from the University of California in 1950.

Leslie E. McCrea, 53, a civil engineer with the city of Miami for the past five years, was killed in an automobile accident May 7 in Gainesville, Fla. He previously worked for the Wilmington, Del., street and sewer department.

Chester W. Adams, 74, former Jefferson County, Ky., surveyor, assistant road engineer and Kentucky district highway engineer, died May 8 in Louisville. He worked with the engineering department of the Louisville Department of Public Works for 10 years and helped plan the Louisville floodwall. He was also a partner in the railroad and highway construction firm of Adams & Sullivan for 20 years. He was a graduate of Rensselaer Polytechnic Institute.

Arthur J. Turner, 76, retired chief engineer for Washington Water Power Co., died recently in Spokane. He had been with WWP for 31 years before retirement in 1945 and had worked on such projects as the Post Falls, Little Falls and Long Lake dams. Before joining the firm he was an engineer on various Pacific Northwest construction projects, including Division St. Bridge in Spokane, Gorge power plant on the Skagit River and Chelan Lake power plant.

C. L. Macrae, 78, retired Navy captain and former public works officer for the 12th Naval District, died May 9 in San Francisco. During his career as a Navy engineer he supervised construction of the Naval Supply Center and Oak Knoll Naval Hospital in Oakland, and expansion of the Navy ammunition depot at Hawthorne, Nev. He also was naval liaison officer on construction of the San Francisco-Oakland Bay Bridge.

Francis J. Engel, 68, formerly a civil engineer with the city engineer's office in Albany, N. Y., died May 6. He obtained his civil engineering degree from the University of Pennsylvania and served the city for many years before retiring in 1953.

Edward J. Cullen, 66, civil engineer with the city of San Francisco since 1926, died Apr. 24. He was a graduate of Stanford University.

Why 4 Reverse Speeds in a motor grader?

Try an ADAMS and see!

● Adams 4 reverse speeds (instead of the usual 2) give you a more flexible speed range for back-up operations—up to 13 mph. This pays big dividends when shuttling back and forth on short stretches, working between forms, etc. Your Adams backs up to starting points quickly, economically—saves production time.

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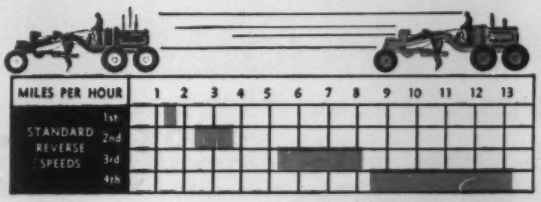
Adams Motor Graders are available in four popular models, 75 to 140 hp. Ask your nearby Adams dealer to show you the size best adapted to your needs—show you how it can do better work, faster, at lower cost than any grader you've ever owned.

Only ADAMS has 4 Reverse Speeds



Adams 4 reverse speeds range from 1.2 to 13.2 mph.—save you valuable time in shuttling back and forth on short stretches, backing to buck snow drifts, etc.

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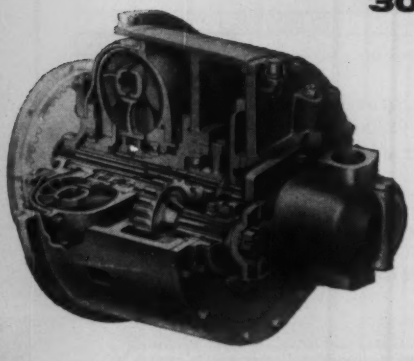

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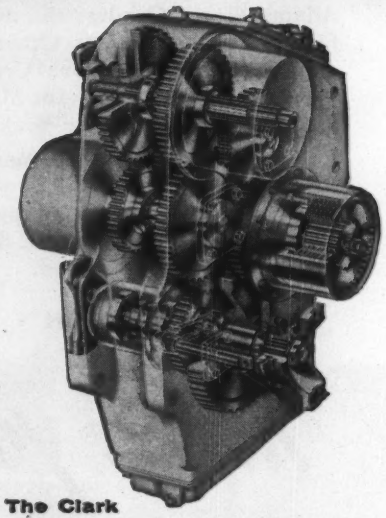
300% torque multiplication when you need it

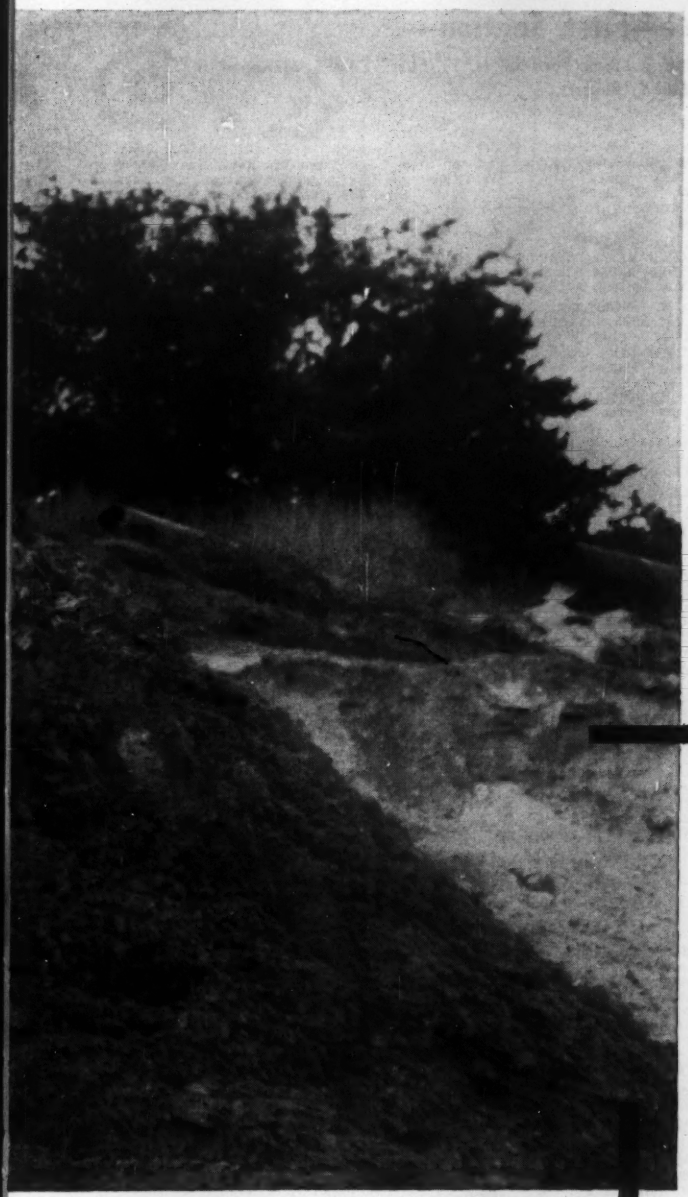
1. You get 3-to-1 torque multiplication automatically when the going is toughest—smooth power, maximum traction.
2. You can't stall the engine—instead you get full power on the bucket cutting edge.
3. No clutch—eliminates the chief cause of operator fatigue and maintenance problems.

From engine to tires, the MICHIGAN power train has been engineered for superior tractor shovel service. For complete details and cutaway drawings, write for Tractor Shovel Broadside.



The Clark Power-Shift Transmission

—and LOOK, NO CLUTCH!



Until you see a MICHIGAN® in action, you won't believe that a tractor shovel can deliver so much power and traction *with such ease of operation!* There's no clutch pedal on a MICHIGAN—it's as simple to drive as a brand-new car. And having eliminated the engine clutch, the MICHIGAN eliminates the most notorious cause of driver fatigue and excessive maintenance cost.

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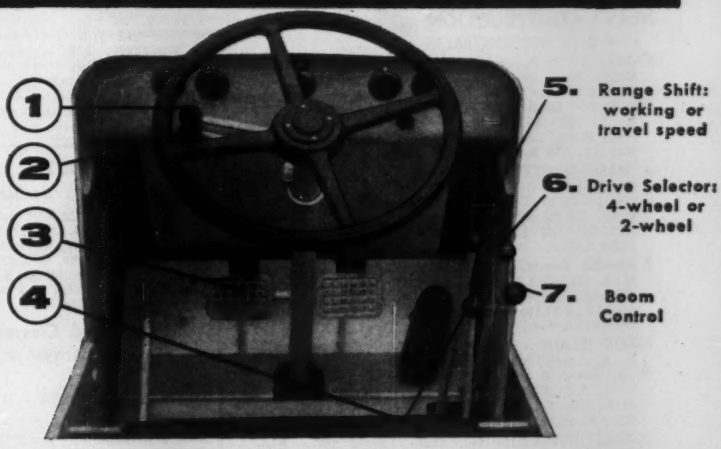
To really recognize the superiority of this machine, all you have to do is see it in action. It's easily arranged, without obligation—write us for a demonstration. And MICHIGAN Tractor Shovels are available under a low cost Leasing Plan—glad to send you full details.



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1. Gears in constant mesh—no gear clash, noise or wear.
2. 4 speeds forward and reverse, up to 27 mph in both directions.
3. Oil re-circulated by pump lubricates entire transmission.
4. Power-shift levers on steering column actuate transmission control valves.
5. To put full power on the bucket, just step on the brake—you automatically put the transmission in neutral.

It's a pleasure to work here!

1. **Forward and Reverse:** easy hand-lever on steering column; make either shift while moving in either direction.
2. **High and Low Speeds:** another easy hand lever.
3. **That's no clutch!** It's a double-pedal brake, use it with either foot.
4. **Break-out bucket action:** work the bucket in the pile—you've got 2 double acting bucket cylinders for tremendous break-out power, independent low-level tip back action.

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Bids Asked—Low Bidders—Contracts Awarded—First Section—

Compiled by Business News Department—Engineering News-Record, 330 W. 42nd St., New York 36, N. Y., ELSIE EAVES, Manager
J. A. MAHONEY, M. O. WETZEL, L. M. WINISKI, M. E. SCIORRA, F. S. DEMBEK, Reports.
J. H. WEBBER, M. R. ROESSLER, E. R. HUBER, Statistics.

NEW ENGLAND

BIDS ASKED—HEAVY CONSTRUCTION

Mass., Taunton—STREET LIGHTING—BA 6/1—State, Dpt. Mental Health, c/o Div. Bldg. Constr., 38 Chauncy St., Boston, M-728, street lighting Myles Standish State School. $20,000. Plans deposit $3, refundable.

† **N. H., Portsmouth**—HYDRANT FUELING SYS.—BA 6/1—U. S. Eng., 857 Commonwealth Ave., Boston, Mass., hydrant fueling sys., Portsmouth Air Force Base, ENG-19-016-55-138. $750,000-$1,000,000. Plans deposit $10. Hayden, Harding & Buchanan, Park Square Bldg., Boston, Mass., engrs. CD 8/11.

† **Rhode Island**—BA 6/1—U. S. Eng., 857 Commonwealth Ave., Boston 15, Mass., repairs to East Breakwater, Block Island, Harbor of Refuge, CIVENG-19-016-55-37.

▲† **Connecticut**—A.A.A. FACILITIES—BA 6/3—U. S. Eng., 857 Commonwealth Ave., Boston, Mass. Special AAA Facilities, Portland, Farmington, Plainville, Simsbury and Bloomfield, ENG-19-016-55-123. $2,500,-000. Extended date. Spector & Montgomery, Falls Church, Va., archts. Crandall Eng. Co., 261 Franklin St., Boston, Mass., engr.

Mass., Boston—BA 6/14—Commonwealth of Mass., Metropolitan Dist. Comn., Sewer Div., 20 Somerset St., Boston, Contr. 212, sewage treatment plant, Clinton. $85,000. Plans deposit $50, refundable. Metcalf & Eddy, Statler Bldg., Boston, engrs.

BIDS ASKED—BUILDINGS

Mass., Roxbury—HOSPITAL—BA 6/2—Boston Lying In Hospital, 221 Longwood Ave., hospital extensive remodel, Longwood Ave. $350,000. Plans deposit $50, refundable, Johnson & Whitcomb, 44 Brattle St., Boston, archts. CD 9/2.

HEAVY CONSTRUCTION

LOW BIDS AND CONTRACTS

MAINE, U. S. A. and NEW BRUNSWICK, CANADA—Maine State Hy. Comn., and Minister of P. Wks. Canada, State House, Augusta, Me.

The Trynor Constr. Co. Ltd., 68 Argyle St., Halifax, N. S. LB $415,403, est. $400,000. bridge work Ferry Point, Calais, Me. and St. Stephen, N. B. Bids May 11. CD 5/6.

▲ **MASSACHUSETTS**—Massachusetts Turnpike Auth., 80 Boylston St., Boston,

Henley-Lundgren Co., 193 Hartford Pike, Shrewsbury, Mass. CA $1,500,182, est. $1,500,000. Contr. 51-073 hy. and bridge constr., Sturbridge. CD 4/19, under LB.

† **Americo Constr. Co., Inc.**, 82 Fulton St., Medford, Mass. LB $243,295, est. $200,000-$300,000. bachelor officers' quarters, Otis Air Force Base, ENG-19-016-55-117, FALMOUTH, MASS. U. S. Eng., 857 Commonwealth Ave., Boston, Mass. CD 4/15.

RHODE ISLAND—State R. I. & Providence Plantations, F. A. Adams, purch. agt., State House, Providence,

M. A. Gammino Constr. Co., 728 Valley St., Providence, R. I., LB $82,330, est. $83,000, highway (relocation of Galilee Rd.-parking lot) parks and recreation, No. 927, Narragansett.

CONNECTICUT—State Hy. Comn., State Office Bldg., Hartford,

D. F. MacNamee & Co., Inc., 271 North Ave., New Rochelle, N. Y., LB, $79,983, resurf. hy. Whitney Ave., Hamden. Bids May 9. CD 4/26.

Fullin Brothers, 299 Westport Ave., Norwalk, Conn., CA $88,370. Section 3, Spring Hill Sewerage Sys., sanitary sewers, Beverly Pl., Ingleside Ave., Arlington, Gordon, Cavanaugh, Lake and Parallel Sts., Pontus Ave. and Bartlett Manor, NORWALK, CONN. City, City Hall, Norwalk, Conn. Bids May 10.

BUILDINGS

LOW BIDS AND CONTRACTS

Albert E. Hodsdon Jr., East Rumford, Me. CA Approx. $100,000, MFG. PLANT, BYRANT POND, ME. Stowell Silk Spool Co., Bryant Pond, Me. CD 4/26.

Columbia Constr. Co., 10 Tremont St., Boston, Mass. CA $965,237, est. $600,000. HOSPITAL alterations, addns., SPRINGFIELD, VT. Springfield Hospital, Ridgewood St., Springfield, Vt. Bids Apr. 18. CD 4/26, under LB.

Town, Supt. School, High St., Hudson, Mass. cancelled bids Feb. 28, high school, Hunter Property, HUDSON, MASS. Est. $700,000. Will re-advertise. CD 3/18, under CA.

▲ **J. F. Rand & Son**, 57 Sudbury St., Boston, Mass. CA $1,134,744, est. $1,000,000. Regional High SCHOOL, Lincoln Rd., LINCOLN-SUDBURY, MASS. Lincoln-Sudbury Regional School District Comn., Lincoln Town House, Lincoln, Mass. CD 5/6, under LB.

Antonelli Constr. Co., Inc., 21 Adams St., Worcester, Mass. CA Approx. $100,000. WAREHOUSE, OFFICE, GARAGE Laraia and Chilmark Sts., WORCESTER, MASS. Jaycee Tobacco Co., Inc., 137 Shrewsbury St., Worcester, Mass. Frank R. Masiello Jr., 10 St. Paul Drive, Worcester, Mass., designer.

D. Bracchi, 239 Main St., Stamford, Conn., LB, $391,-950, est. $350,000. POLICE HEADQUARTERS, Bedford and Hoyt St. Exten. STAMFORD, CONN. City, City Hall, Stamford, Conn. Bids May 10. CD 4/18.

R. D. Rich Constr. Co., Inc. & Henry M. Weitzner, Inc., 322 Main St., Stamford, Conn., CA, $600,000. 25-store SHOPPING CENTER, 6-acre tract on Summer St. STAMFORD, CONN. Town & Country Shopping Center, c/o contractor. Paul Sternbach & Alton Rheaume, 366 Atlantic St., Stamford, Conn., archts.

Green Acres, Inc., c/o Louis & Henry Beckanstein, 2690 Albany Ave., West Hartford, Conn. Owner Builds. $800,000, 46 new RESIDENCES, Oakdale Terraces, Oakdale and Harding Rds., WETHERSFIELD, CONN.

MIDDLE ATLANTIC

BIDS ASKED—HEAVY CONSTRUCTION

† **D. C., Wash.**—ELECTRICAL DISTRIBUTION—BA 6/1—Dist. P. Wks. Office, Potomac River Naval Command, Naval Gun Factory, Wash., D. C, electrical distr. alterations, addns., Bldg. 5, Naval Security Station, NOY 88727. Plans deposit $10.

N. Y., Perrysburg—GROUND IMPRVS.— BA 6/2—Bureau Contracts & Accounts, The Governor Alfred E. Smith State Office Bldg., Albany, ground imprvs., Clinic Operating Suite and Administration Bldg. No. 44, J. N. Adam Memorial Hospital. Plans deposit $10.

New York—TRACKS and CONTACT RAIL—BA 6/3—New York City Transit Auth., 370 Jay St., Brooklyn, Zone 1, rehabilitation of tracks and contact rail across Jamaica Bay, Rte. No. 119-G, Rockaway Lines, Hamilton Beach to Hammel, Queens Boro. CD 8/31/45.

New York—BA 6/7—The Power Authority of the State of New York, 270 Broadway, New York, furnishing, del. 120,000 KVA three phase autotransformers, St. Lawrence Contr. Power Proj., Spec. PA-4-14003. St. Lawrence Contr. No. P14. Plans deposit $10. Uhl, Hall & Rich, 230 Congress St., Boston 10, Mass. engrs. CD 8/18.

PROJECTS COVERED

By Size

Construction projects here reported cover the United States and Canada, are of these minimum sizes or larger: water supply, earthwork, waterways $44,000; other public works $73,000; industrial buildings $93,000; other buildings $344,000. Also Foreign projects of $100,000 and more in size of interest to American contractors.

By Regions & Classes of Construction

(In order of Listing)

BIDS ASKED
LOW BIDDERS
CONTRACTS AWARDED

New England	Middle West
Middle Atlantic	West of Mississippi
South	Far West

PROPOSED WORK

Water Supply	Public Buildings
Sewers, Waste Disposal	Mass Housing
Bridges	Commercial Buildings
Streets & Roads	Industrial Buildings
Earthwork, Waterways	Unclassified

In These Stages

PROPOSED WORK: Before and including appointment of engineers or architects.
BIDS ASKED: BA (new announcements only). For full calendar, see also preceding issues.

LOW BIDDERS: LB On jobs below $500,000 in value all low bidder news will be the final reports published on the projects involved except where award is not made to the low bidder. In this case, a supplementary contract award report will be published.

CONTRACTS AWARDED: CA Except awards to low bidders previously reported in low bidder stage.

CD dates shown are of Construction Daily issue in which last previous report was published.

Symbols and Abbreviations Include:

†	Federal Government
▲	Project of $1,000,000 or over.
ENR	Engineering News-Record
CD	Construction Daily

For additional reports see Construction Daily.

† **Md., Patuxent River**—BA 6/8—Dist. P. Wks. Office, Potomac River Naval Command, Naval Gun Factory, Wash., D. C., surface tr. of parking areas near bldgs. 306, 406, 504 and 588, Naval Air Station, NOY 86490. Plans deposit $10. CD 7/17/52.

† **D. C., Wash.**—EXHIBITS, etc.—BA 6/9—General Services Admin. P. Bldgs. Serv., Regional Office Bldg., 7 and D. Sts. N. W., Zone 25, modernization of exhibits (Power Hall) Smithsonian Institution. CD 10/26/45.

NEW JERSEY-PENNSYLVANIA—BA 6/9—Delaware River Port Auth., Administration Bldg., Bridge Plaza, Camden, N. J.

Contract G-4, stringer spans, superstructure from Newton Creek to North-South Freeway on bridge over Delaware River connecting Packer Ave., Phila., Pa. and Gloucester N. J. Plans deposit $10. CD 9/26/52.

N. Y., Brentwood—BA 6/9—Bureau Contracts & Accounts, The Governor Alfred E. Smith State Office Bldg., Albany Incinerator building, Pilgrim State Hospital. Plans deposit $20.

PENNSYLVANIA—BA 6/9—Pennsylvania Turnpike Comn., 11 N. 4 St., Harrisburg,

Carbon Co.—constr. 4.07 mi. sect. of Northeastern exten. of Turnpike, Sect. 36-G, Franklin Twp. and Parryville Boro. CD 10/28/53.

† **Md., Andrews Air Force Base**—HANGAR, etc.—BA On Or About 6/21—U. S. Eng., First and Douglas Sts. N.W., Wash. 25, D. C., hangar, shops and boiler house, ENG-49-080-55-80-(71). CD 3/15.

† **N. Y., Plattsburgh**—COLD STORAGE—BA 6/21—U. S. Eng., 111 E. 16 St., New York, Zone 3, cold storage warehouse, F Y 53, Plattsburgh Air Force Base. $100,000-$500,000. Extended date. Seelye, Stevenson, Value & Knecht, 101 Park Ave., New York, Zone 17, engrs. CD 4/15.

† **Md., Andrews Air Force Base**—CHAPEL—BA On Or About 6/22—U. S. Eng., First and Douglas Sts. N.W., Wash. 25, D. C., chapel, ENG-49-080-55-75-(65). CD 8/9.

† **Md., Andrews Air Force Base**—APRON PAVING—BA On Or About 6/23—U. S. Eng., First and Douglas Sts. N.W., Wash., D. C, west apron paving, Andrews Air Force Base, ENG-49-080-55-70-(60). CD 8/9.

† **N. Y., Elmira**—CEMETERY DRAINAGE—BA 6/23—U. S. Eng., 111 E. 16 St., New York, Zone 3, drainage, FY 55, Woodlawn National Cemetery. $100,000. Lambert & Dell'Abate, 1 E. 42 St., New York, Zone 17, archts.

† **N. Y., Farmingdale**—CEMETERY ROADS, etc.—BA 6/23—U. S. Eng., 111 E. 16 St., New York, Zone 3, roads, water supply at Long Island National Cemetery. $100,000. Lambert & Dell'Abate, 1 E. 42 St., New York, Zone 17, archts.

▲† **New York**—AAA FACILITIES—BA 8/10—U. S. Eng., 111 E. 16 St., New York, Zone 3, AAA Facilities, Niagara Area, FY 55, at Hamburg, $1,000,000-$3,-000,000, Brown, Guenther & Booss, 1860 Broadway, New York, archts.; at Cambria, $500,000-$1,000,000; at Mill Grove, $1,000,000-$5,000,000; at Millersport, $1,000,000-$3,000,000; at Lake Ontario, $500,000-$1,000,000 Greenberg & Ames, 303 Fourth Ave., New York, Zone 10, archts. CD 2/18.

BIDS ASKED—BUILDINGS

N. Y., Kings Park—SERVICE CONNECTIONS—BA 6/2—Bureau Contracts & Accounts, The Governor Alfred E. Smith State Office Bldg., Aubany, service connections, Kings Park State Hospital. Plans deposit $10. Extended date. CD 4/25.

▲† **N. Y., Watervliet**—REHABILITATION BLDGS.—BA 6/7—U. S. Eng., 111 E. 16 St., New York, Zone 3, rehabilitation buildings, FYY 55, Watervliet Arsenal. $1,000,000-$3,000,000. Sargent, Webster, Crenshaw & Folley, 310 Natl. Bank Bldg., Watertown, archts. CD 5/6.

† **N. Y., Romulus**—STORAGE and SERVICE FACILITIES—BA 6/8—U. S. Eng., 111 E. 16 St., New York, Zone 3, special storage and servicing facilities, Seneca Ordnance Depot, ENG-30-075-55-463. CD 5/6.

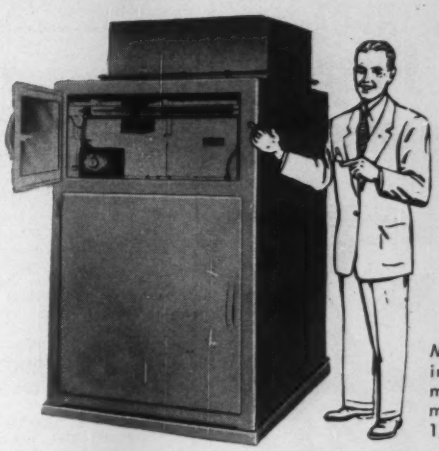
N. Y., New York—HOUSING—BA 6/14—New York City Housing Auth., 299 Broadway, Zone 7, (1) foundation and general constr. (2) heating and ventilating, (3) electrical work, (4) plumbing; furnishing and erecting elevators for General Grand Houses, Proj. No. NY-5-30, Sect II, incl. Buildings Nos. 6 to 9 (inclusive) in area bounded by W. 125 St. and Morningside Ave., W. 123 St. and Amsterdam Ave. Manhattan Boro. Plans deposit $75, $25 elevators. CD 11/15/51.

▲† **N. Y., Watervliet**—BOILER PLANT—BA 6/14—U. S. Eng. 111 E. 16 St., New York, Zone 3, modernization and rehabilitation of boiler plant and steam distr. lines, Watervliet Arsenal, Serial No. ENG-30-075-55-452. $1,000,000-$1,500,000. Plans deposit $50. CD 2/17.

† **N. Y., Schenectady**—TRAINING CENTER—BA 6/16—U. S. Eng. 111 E. 16 St., New York, Zone 3, 600-man unit Army Training Center, FY 53. $100,000-$500,000. Extended date. Robert A. Green, Tower Hill, Tarrytown, archt. CD 4/15.

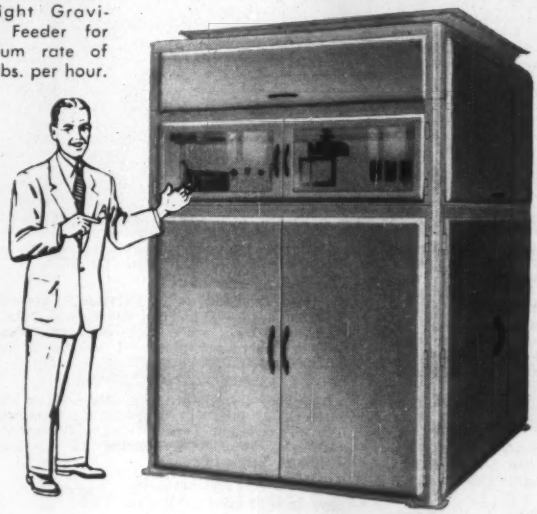
(Continued on page 110)

Model GLW-0 Loss-in-Weight Gravimetric Feeder for maximum rate of 100 lbs. per hour.



Model GLW-1 Loss-in-Weight Gravimetric Feeder for maximum rate of 1,000 lbs. per hour.

Model GLW-2 Loss-in-Weight Gravimetric Feeder for maximum rate of 4,000 lbs. per hour.



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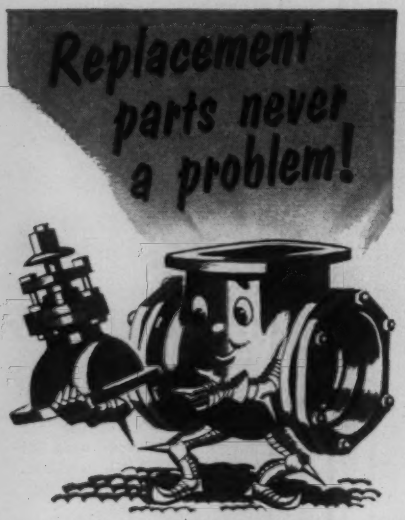

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- Conform to all A.W.W.A specifications.

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A Subsidiary of James B. Clow & Sons
WATERFORD, NEW YORK

(Continued from page 108)

N. Y., New York—SHELTER—BA 6/22—Dpt. P. Wks., Municipal Bldg., Zone 7, Contr. 1, general constr.; Contr. 2, plumbing; Contr. 3, heating and ventilating; Contr. 4, electrical work for constr. Shelter for Delinquent Children (Boys), at 1221 Spofford Ave., Bronx Boro. Plans deposit $100. CD 10/27/52.

† N. Y., Poughkeepsie—TRAINING CENTER—BA 6/22—U. S. Eng., 111 E. 16 St., New York, Zone 3, 200-man unit Army Training Center, FY 53. $100,000. Extended date. Robert A. Green, Tower Hill, Tarrytown, archt., CD 4/15.

† N. Y., West Point—KITCHEN REHABILITATION—BA 6/28—U. S. Eng., 111 E. 16 St., New York, Zone 3, kitchen rehabilitation, Hotel Thayer, U. S. Military Academy. $100,000-$500,000. O'Connor & Kilham, 101 Park Ave., New York, Zone 17, archts. CD 4/15.

† N. Y., Grand Island—HOUSING—BA 8/10—U. S. Eng., 111 E. 16 St., New York, Zone 3, housing, FY 53, at AAA Facilities, Niagara Area. $100,000. William S. Lozier, 10 Gibbs St., Rochester, archt.

N. J., Nutley—FACTORY—Bids Asked—Federal Leather Co., 681 Main St., Belleville, 5 factory buildings, 5-acre tract. $120,000.

HEAVY CONSTRUCTION

LOW BIDS AND CONTRACTS

▲ **James Mitchell, Inc.,** 75 Montgomery St., Jersey City, N. J., CA $1,331,000, constr. 7 story, 150 ft. high, 61x107 ft. steel, masonry New Jersey Ventilation Bldg. for Third Tube of Lincoln Tunnel, NEW YORK-NEW JERSEY. The Port of New York Auth., 111 8th Ave., New York 11, N. Y. Bids Apr. 19. CD 4/22, under LB.

▲ **Terry Contg., Inc.,** 31 E. 27 St., New York 16, N. Y., LB $5,247,660, Contr. 7, Queens approach and addnl. connections; LB $7,846,490, Contrs. 5, 6 and 7, constr. addnl. north upper roadway approaches and connections for Queens Boro Bridge over East River between Manhattan and Queens Boros., NEW YORK, N. Y. Dpt. P. Wks., Municipal Bldg., New York 7, N. Y., Bids May 11, CD 5/2;
Woodcrest Constr. Co., Inc., 369 Lexington Ave., New York 17, N. Y, LB $1,154,990, Contr. 5, Manhattan approach and northerly connection to upper deck roadway (New York, N. Y.);
Peerless Constr. Co., Inc., 107 Mamaroneck Ave., White Plains, N. Y., LB $1,295,000, Contr. 6, addnl. north upper roadway on bridge structure between anchor piers (New York, N. Y.).

Hercules Contr. Co. & Hauling Corp., 1590 Richmond Terrace, Staten Island, N. Y., LB $344,284, Contr. No. BPR-1, Rector Street Interceptor Collector, Jewett Ave., Hurst and Rector Sts., Richmond Boro, sewers, tributary to Port Richmond Pollution Control Proj., PORT RICHMOND, N. Y. Dpt. P. Wks., Municipal Bldg., New York 7, N. Y. Bids May 11. CD 4/19.

† **James M. Martin, Inc.,** 503 W. 43 St., New York 36, N. Y., LB $88,472, theatre air-conditioning, FY 1955, U. S. Military Academy, Serial No. ENG-30-075-55-431, WEST POINT, N. Y. U. S. Eng., 111 E. 16 St., New York 3, N. Y. Bids May 12. CD 4/15.

BUILDINGS

LOW BIDS AND CONTRACTS

Alex Eisenberg, 2022 Avenue K, Brooklyn, N. Y. Separate Contracts. $250,000. 2 story milk bottling PLANT alterations, 400 Stanley Ave., BROOKLYN, N. Y. CD 3/16.

Alex Eisenberg, 2002 Avenue K, Brooklyn, N. Y. Separate Contracts. $200,000. 1 story MILK DEPOT, 240-84 Malta St., BROOKLYN, N. Y. CD 3/30.

Irving Kay & Sons, c/o George Miller, archt., 125 W. 45 St., New York 19, N. Y. Owner Builds. $600,000. 7 story APARTMENT, Ocean Ave. between Avenue Y and Z, BROOKLYN, N. Y.

▲ **Briar Point Homes,** c/o Stanley J. Shaftel, archt., 89-47 163 St., Jamaica, N. Y. Owner Builds. $10,000,000. 740 HOUSES, SHOPPING CENTER, 222-acre tract, Jericho Turnpike, east of Larkfield Rd., EAST HUNTINGTON, N. Y.

▲ **Village of Birchwood Park Homes,** c/o Stanley H. Klein, archt., 89-31 161 St., Jamaica, N. Y. Owner Builds. $59,000,000. 2600 HOMES, 760-acre tract Broadway near Exit 35 of Northern State Parkway, JERICHO, N. Y.

▲ **Garden Parkway Homes,** c/o Percy S. Simon, archt., 362 Cedar Lane, Teaneck, N. J. Owner Builds. $3,000,000. 266 HOUSES 50 acre tract, KEYPORT, N. J.

Albert & Harrison, Inc., 1504 Sheridan Ave., New York, N. Y Owner Builds. $400,000. 6 story APARTMENT, 100-108 Bank St., NEW YORK, N. Y. CD 3/16.

55 St.-Lexington Corp., 391 E. 149 St., New York 55, N. Y. Owner Builds. $375,000. 8 story APARTMENT, 150-160 E. 55 St., NEW YORK, N. Y. CD 3/28.

▲ **Rockvale Realties, Inc.,** 521 Fifth Ave., New York 17, N. Y. Owner Builds. $1,200,000. APARTMENT, 333-39 E. 79 St., NEW YORK, N. Y CD 4/6.

▲ **TAK Realty Corp.,** 1160 Utica Ave., Brooklyn, N. Y. Owner Builds. $1,000,000. 16 story APARTMENT, 1227-31 Madison Ave. and 48 E. 89 St., NEW YORK, N. Y. CD 3/30.

▲ **Edward Corning Co.,** 204 E. 39 St., New York 16, N. Y. CA $1,219,284, general constr. JUNIOR HIGH SCHOOL, Denton Pl. and Wagner Ave., ROOSEVELT, N. Y. Roosevelt Public School Bd., Washington Ave., Roosevelt, N. Y. CD 6/3.

▲ **Oakwood Gardens Homes,** c/o Stanley H. Klein, archt., 89-31 161 St., Jamaica, N. Y. Owner Builds. $3,000,000. 120 HOUSES, 36-acre tract, Valentine Rd. and Newbridge Ave., WESTBURY, N. Y.

James Stewart Co., Inc., 230 Park Ave., New York 17, N. Y. CA $943,000. 59x408x106 ft. rein-con. GRAIN ELEVATOR at Port Covington Terminal, BALTIMORE, MD. Western Maryland Ry. Co., F. L. Etchison, ch. engr., Standard Oil Bldg., Baltimore 2, Md. Franklin R. Lawrence, c/o owner, engr. CD 8/11/53, under Unclassified.

▲ **Gorm Bros., Inc.,** 1926 Ridgewood Ave., Baltimore 15, Md. Separate Contracts. $1,070,000. one hundred and one 1½ story, 39x42x12 ft. frame, masonry DWELLINGS, 3200, 3300, 3500 Bonnie Rd., 7000 and 7100 block Boxford Rd., 3200 Nerak Rd., 3300-3400 Hatlan Rd., BALTIMORE, MD.

▲ **William E. Cramer,** 2601 Connecticut Ave. N.W., Wash., D.C. LB $2,198,000. Northwest Bethesda High SCHOOL, Bethesda, ROCKVILE, MD. Montgomery Co. Bd. Educ., Rockville, Md. Bids May 12. CD 4/25.

▲ **Leimbach Constr. Corp.,** 3906 Hickory Ave., Baltimore, Md. LB $1,932,500. Dumbarton SCHOOL, TOWSON, MD. Baltimore Co. Bd. Educ., Aigburth Rd., Towson, Md. Bids May 11. CD 4/15.

Housing Corp. of America, Cafritz Bldg., Wash., D. C. Owner Builds. $650,000. Third section 65 HOMES between Connecticut Ave. and Viers Mill Rd., WHEATON, MD. John d'Epagnier, 1004 Ripley St., Silver Spring, Md., archt.

† **Allis-Chalmers Co.,** Wyatt Bldg., Wash., D. C., LB $197,679, designing, manufacturing, shop testing, delivering, installing electric power equip., associated accessories for Capitol POWER PLANT, WASH., D. C. Office of the Architect of the Capitol, U. S. Capitol, Wash., D. C. Bids May 10. CD 4/21.

SOUTH

BIDS ASKED—HEAVY CONSTRUCTION

Va., Fairfax—BA 5/31—Bd. Supervs., Fairfax Co., at office Harry L. Hale, sanitary engr. County Office Bldg., Contr. No. 47, approx. 6,200 lin. ft. 8 in. sanitary sewers, appurtenances. Plans deposit $5. CD 12/22/53.

† Fla., Miami—ALARM SYSTEMS, etc.—BA 6/9—Dist. P. Wks. Office Bldg. No. 12, U. S. Naval Base, Charleston, S. C., evacuation alarm system and automatic fire detection sys. in various buildings, U. S. Marine Corps. Air Station, NOY 88285, Spec. 47194. Plans deposit $10.

† La., Alexandria—DORMITORIES—BA About 6/15—U. S. Eng., P. O. Box 867, Little Rock, Ark., Job No. Alexandria AFB-55-ACRP—ADV P-55-ACRP-AF, Airmen's Dormitories No. 2A, Item No. T-016 (G-311), Alexandria Air Force Base, ENG-03-050-55-123.

† Georgia—BA 6/30—U. S. Eng., P. O. Box 1169, Mobile 7, Ala., clearing, topping approx. 23,546 mi. acres in Gwinnett, Hall, Forsyth, Dawson and Lumpkin Counties in Buford Dam area. CD 8/25.

BIDS ASKED—BUILDINGS

† Ky., Fort Campbell—POST EXCHANGE, etc.—BA On Or About 6/14—U. S. Eng., 306 Federal Office Bldg., Nashville, Tenn., main post exchange bldgs. and utilities and dismantling and salvage 2 barracks bldgs., ENG-40-058-55-22. CD 7/9/51.

SOON LETS CONTRACT—BUILDINGS

Ky., Owensboro—WAREHOUSE—Southern States Richmond Co-operative, Inc., 9 and Byrd Sts., Richmond, Va., soon lets contract, 1 story, 55x136 ft. concrete slab warehouse, Torrence & Dreelin, 15 E. Cary St., Richmond, Va., archts.

HEAVY CONSTRUCTION

LOW BIDS AND CONTRACTS

FLORIDA—State Road Dpt., Tallahassee,
Marion Constr. Co., Box 577, Ocala, Fla., CA, $735,956, rock base, bit., b. conc. 18.815 mi. State Rd. 500 F-029-1 (3), Job 3607201, Marion Co. Bids Apr. 28, awarded May 11, CD 5/3, under LB.

▲† **Henry C. Beck Co.,** First Natl. Bank Bldg., Atlanta, Ga., CA, $1,181,000. overhaul and repair facilities extensions, alterations to Building 101, U. S. Naval Air Station, JACKSONVILLE, FLA. Sixth Naval Dist. Bldg. 12, U. S. Naval Base, Charleston, S. C. Bids Apr. 7. CD 3/7.

† **W. Horace Williams Co., Inc.,** 833 Howard Ave., New Orleans 13, La., CA $121,400. rehabilitation timber wharves Naval Station, NOY 84236, NEW ORLEANS, LA. Dist. P. Wks. Office, Eighth Naval Dist., Bldg. 16, Naval Station, New Orleans, La. Bids Apr. 14. CD 3/28.

▲ KENTUCKY—Commonwealth of Ky., Dpt. Hys., Frankfort,
Ky.—**Middle West Roads Co.,** 1201 Short St., Louisville, Ky. CA $571,776. b. conc. Class I surf. 13.692 mi. Gilbertsville-Paducah Rd., F 530 (8), SP 79-653, SP 79-393, SP 73-432, Marshall and McCracken Counties;
Ky.—**Ellis, Kelly Co.,** Owensboro, Ky. CA $546,222. c. conc. slope protection At. 3 1.883 mi. Morganfield-Shawneetown Rd., F 165 (3), SP 113-267, Union Co. CD 5/10, under LB.

BUILDINGS

LOW BIDS AND CONTRACTS

▲ **Daniel Constr. Co.,** 429 N. Main St., Greenville, S. C., CA $8,000,000, 400,000 sq. ft. windowless-air-conditioned woolen MILL, BARNWELL, S. C. Textron American, Inc., 225 Fourth Ave., New York 10, N. Y. Lockwood-Greene Engineers, Inc., 10 Rockefeller Plaza, New York 20, N. Y., engr.

Fiske-Carter Constr. Co., P. O. Box 1251, Spartanburg S. C., CA Est. $420,000. 1 story, 42,000 sq. ft. steel, brick MACHINE SHOP addn., railroad siding, shiping facilities, storage yard, EAST SPARTA, S. C. Draper Corp., Arcadia, S. C. Lockwood Greene Engineers, Inc., Montgomery Bldg., Spartanburg, S. C., engr.-archt. CD 4/18/52, under S. C., Spartanburg.

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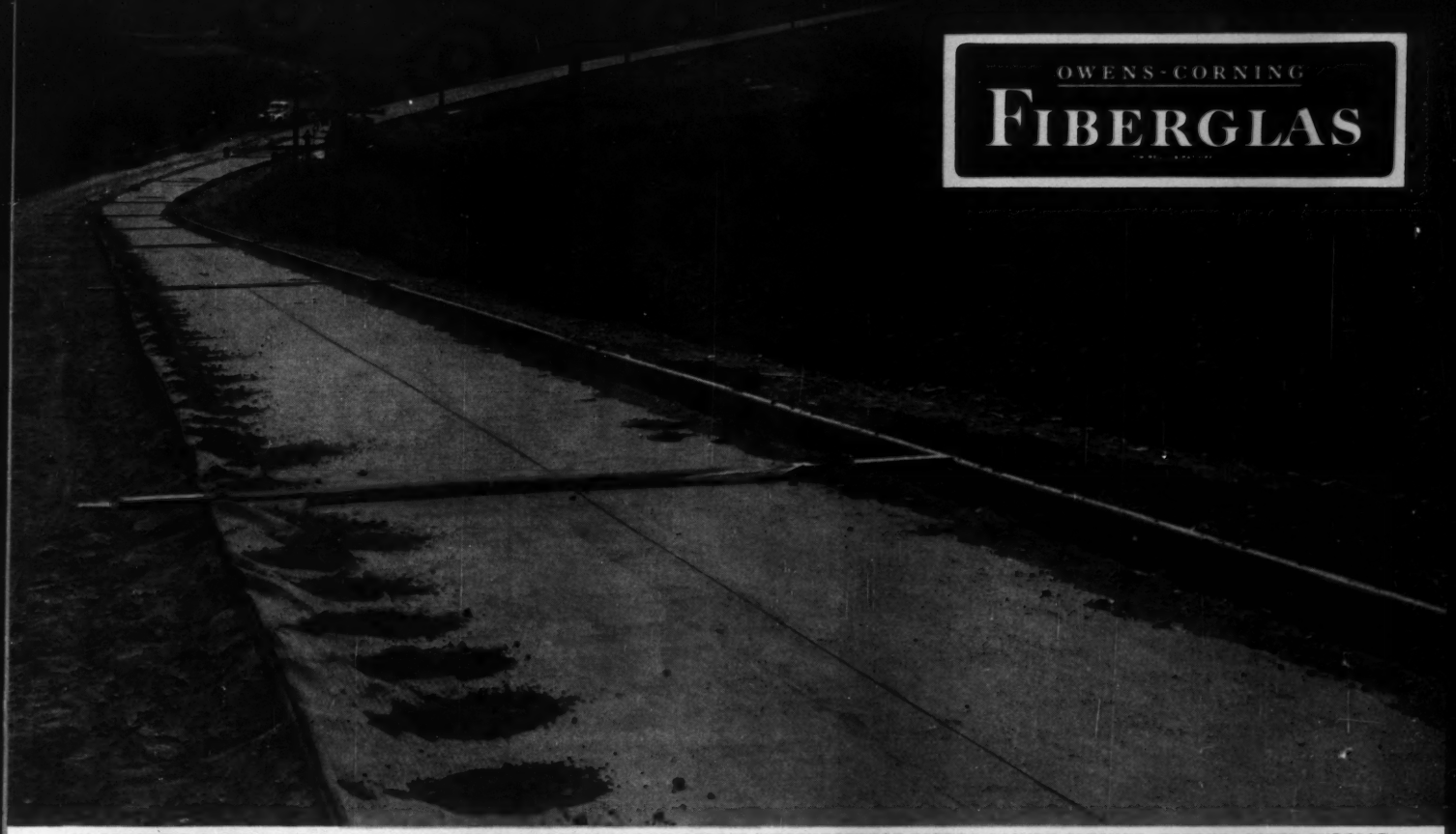

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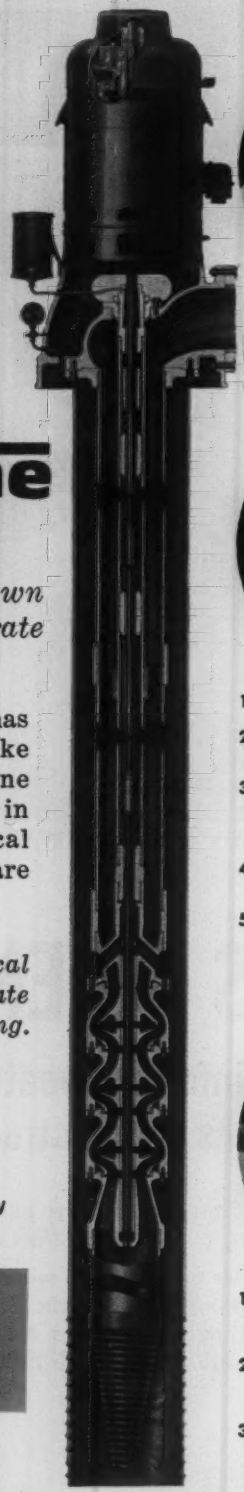

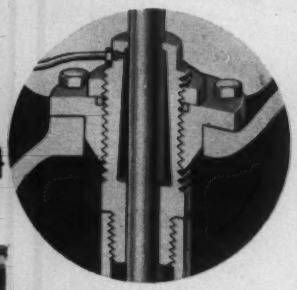

This easily accessible assembly provides means of putting tension on oil tubing, making a rigid, taut, non-vibrating bearing and shaft enclosure.

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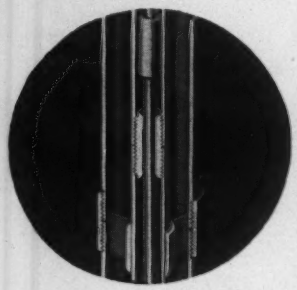

1. Butt-joint column pipe is usually furnished in 10 ft. lengths.
2. Sleeve type pipe couplings are standard. Flanged type also available.
3. Reinforced rubber enclosing tube supports assure alignment of oil tube and are spaced as specified by Layne & Bowler engineers.
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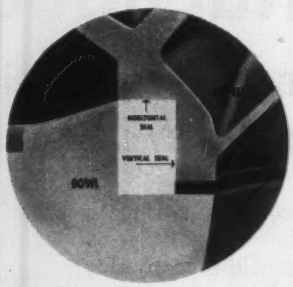

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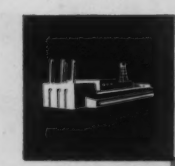
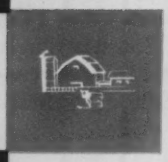
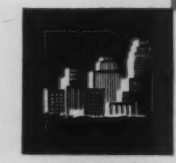
3. Perihedral seal combines vertical cylindrical and horizontal surface impeller sealing. Shaft stretch due to pressure change is not critical, because of vertical cylindrical seal. However, adjustment for wear to restore original capacity is easily accomplished by means of an adjusting nut in the top of the driver that brings into action the horizontal part of the Perihedral seal — an exclusive Verti-Line feature.



in all industry

on the farm





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(Continued from page 110)

G. W. Hallmark & Sons, 1528 11 Ave. N., Birmingham, Ala., CA, $391,463, Baldwin County COURTHOUSE expansion, renovations, BAY MINETTE, ALA., Comrs. Baldwin Co. Bay Minette, Ala. Awarded May 4. CD 5/6.

MIDDLE WEST

BIDS ASKED—BUILDINGS

▲ Ind., Columbus—SCHOOL—BA 6/14—School City, Luther Lockwood, supt. Schools, High School Bldg., Columbus, high school. $1,000,000. CD 2/10/53.

O., Oxford—SCHOOL—BA 6/16—Oxford-Hanover School Dist. (Talawanda), Oxford, school bldg. and addns., $900,000. Potter, Tyler, Martin & Roth, 128 E. 6th St., Cincinnati, engrs.-archts. Bids May 4 rejected, LB $779,000. CD 5/12, under LB.

▲ Mich., Royal Oak—SCHOOL—BA 6/17—City, Bd. Educ., Clarence Kimball, pres., 1026 N. Main St., 1 and 2 story, 200,000 sq. ft. high school. $4,000,000. Plans deposit $50 for general, $30 for mechanical trades, $30 for electrical, refundable. O'Dell, Hewlett & Luckenbach, 950 N. Hunter Blvd., Birmingham, archts. CD 4/28.

Wis., Milwaukee—FACTORY—Bids Asked—Ken Cook Co., 2227 N. Humboldt Ave., 1 story, 110x130 ft., concrete steel, brick, block factory. J. Miller, 13375 Watertown Plank Rd., assoc. archt. A. O. Reddemann Elm Grove, archt.

HEAVY CONSTRUCTION

LOW BIDS AND CONTRACTS

† Joseph Skilken & Co., 383 S. Third St., Columbus 15, O., CA $945,818, Air Defense Command Facilities, Lockbourne Air Force Base, ENG-46-022-55-14, COLUMBUS, O. U. S. Eng., 237 Fourth Ave., Huntington 18, W. Va. Bids Apr. 28. CD 5/3, under LB.

† Marion Contg. Corp., 194 S. State St., Marion, O. CA $191,097, concrete floor and fire walls and install automatic sprinkler sys. in Open Shed T-303, Inv. AII-33-062-55-16B, MARION, O. Marion Engineering Depot, Marion, O. CD 11/21/50.

WISCONSIN—State Hy. Comn., Madison,
The White Constr. Co., 710 North Plankinton Ave., Milwaukee 3, Wis., CA, $528,419. Contract 1, c. conc. base and b. conc. 1.416 mi. S.T. Hy. 59, Proj. F 5705-(3), Milwaukee Co.; CA $189,589. Contract 1, base and c. conc. 2.438 mi. Proj. T-0844 (2), Kenosha Co. Bids May 10. CD 5/13, under LB.

▲ WISCONSIN—State Hy. Comn., Madison,
rejected bids May 10, grading, base 6.972 mi. U. S. Hys. 18 and 151, Proj. F 017-2 (12), Dane Co., LB $1,008,422; Contract 2, grading, base 2.96 mi. U. S. Hys. 18 and 151, Proj. F 017-2 (12), Dane Co. LB $598,344. CD 5/13, under LB.

▲† H. Turner & Sons Co., Boscobel, Wis., CA $1,285,722. East-West Runways, Camp Williams Air Field, ENG-47-013-55-13, CAMP DOUGLAS, WIS. U. S. Eng., 428 Federal Bldg., Milwaukee 1, Wis. Bids Mar. 29. CD 4/1, under LB.

J. C. Theilacker Co., 5924 W. Washington Blvd., Milwaukee, Wis., LB $256,747, wid'n. S. 6 St. bridge over S. Menomonee Canal, MILWAUKEE, WIS. City, City Hall, Milwaukee, Wis. Bids May 10. CD 4/21.

Milis Constr. Co., 4295 N. 127 St., Milwaukee, Wis., CA $75,919, crushed stone pavement W. Caldwell St. MILWAUKEE, WIS. City, City Hall, Milwaukee, Wis. Bids May 6, awarded May 9.

▲ Bryant & Detwiler Co., 2110 Penobscot Bldg., Detroit, Mich. CA $2,981,400. Contr. NE-10 high lift pumping station, 1100 East Eighth Mile Rd., DETROIT, MICH. City, Bd. Water Comrs., 735 Randolph St., Detroit, Mich. CD 5/6, under LB.

BUILDINGS

LOW BIDS AND CONTRACTS

▲ McGraw Constr. Co., P. O. Box 272, Middletown, O. CA Est. $9,000,000. main mfg. PLANT, NAPOLEON, O. Campbell Soup Co., 100 Market St., Camden, N. J. Bids Mar. 8. CD 3/8.

C. E. Harlos, Inc., 219 W. 4 St., Bloomington, Ind., CA $679,922, Rogers Elementary SCHOOL and McCalla SCHOOL addn., BLOOMINGTON, IND. Bloomington Metropolitan Schools, Bloomington, Ind. Bids Apr. 26, awarded May 6. CD 5/2, under LB.

Huber, Hunt & Nichols, P. O. Box 128, Indianapolis, Ind., CA $800,000. Southern District HEADQUARTERS CLARKSVILLE, IND. Public Service Co. of Indiana, 1000 E. Main St., Plainfield, Ind. Bids May 5, awarded May 9. CD 5/12, under LB.

The Stanley Co., 19 E. 34 St., Indianapolis, Ind., Owner Builds, $400,000. HOMES in Fairview addn., GREENFIELD, IND.

Atlantic Constr. Co., 4221 N. Ritter Ave., Indianapolis, Ind., Owner Builds, $800,000. new group of HOUSES, east side, INDIANAPOLIS, IND.

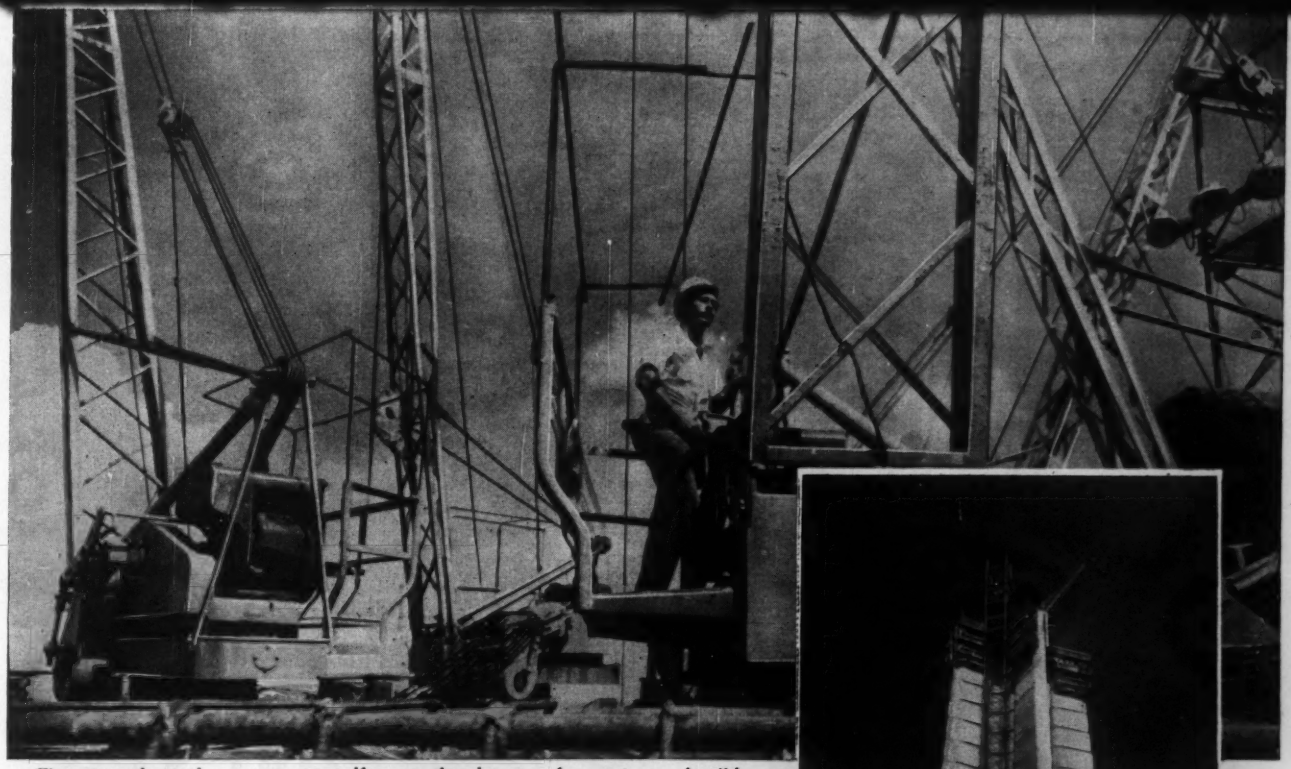
Marton Constr. Co., W. Washington St. and Bridgeport Rd., Indianapolis, Ind. Owner Builds, $600,000. HOMES, on West Side, INDIANAPOLIS, IND.

▲ Palin Constr. Co., 1260 Udell St., Indianapolis, Ind., Owner Builds, $1,000,000, HOMES in new addition, INDIANAPOLIS, IND.

Edw. H. Meyer Constr. Co., Box 705, Neenah, Wis., CA $350,000, 2 story, 641x35 ft. RESEARCH BLDG., PORT EDWARDS, WIS. Nekoosa-Edwards Paper Co., Port Edwards, Wis. Donn Hougen, 132 E. Grand Ave., Wisconsin Rapids, Wis., archt.

Selzer-Ornst Co., 6222 W. State St., Wauwatosa, Wis., CA $460,000. 2 story, 189x239 ft., rein.-con., steel, brick MANUFACTURING and OFFICE, WAUWATOSA, WIS. Stroh-Die Molded Casting Co., 525 E. Michigan St., Milwaukee, Wis. CD 1/5.

(Continued on page 114)



This view shows how compact, self-contained Whirlettes operate in close quarters. Small foundation area and the absence of guy wires and stiff legs permit efficient use of limited working space. Operator always faces the load

5 CLYDE WHIRLETTES "STAR" ON HAVANA'S STAR-SHAPED MARTI MONUMENT

Five points . five Clyde Whirlettes! A simple and effective symmetry of method matches the symmetry of design as the unique monument rises in Havana, Cuba. Honoring the Cuban patriot Marti, this 330-foot structure is being built in the shape of a five-pointed star. A compact, self-contained Clyde Whirlette on each point provides safe, efficient material handling to keep construction on schedule.

NO GUY WIRES • FULL REVOLVING • SELF-CONTAINED

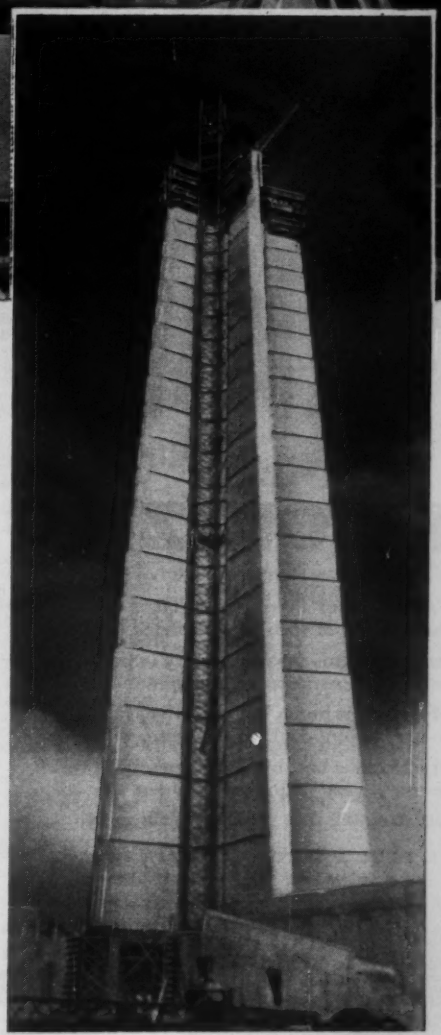
Full revolving, self-contained Clyde Whirlettes prove star performers wherever they are used. Compact, they need only the barest minimum of foundation space, full-revolving, they service large areas. Both features pay off in faster schedules, lower costs. With no guy wires or stiff legs needed, Clyde Whirlettes work efficiently even in congested areas. The operator turns with the boom . always faces load and work.

Clyde Whirlettes are available with either electric or gasoline power, either manual or mechanical swing, in two popular sizes

Model W-3 Whirlette, two drums for hook work only Capacities from 10,000 lbs. at 10 ft. radius to 2,000 lbs. at 40 ft radius

Model W-45 Whirlette, two or three drums for hook work or clam shell. Capacities from 24,000 lbs at 10 ft radius to 2,500 lbs at 60 ft. radius

Complete facts on Clyde Whirlettes should be an essential part of your equipment information file To have these facts in handy, easily-referred-to form, write for descriptive literature



How to work upon a star! On top of this 330-foot star-shaped monument, five, work-hungry Clyde Whirlettes are located, one on each of the five points.

HOISTS—DERRICKS—WHIRLEYS—BUILDERS TOWERS—CAR PULLERS—HANDI-CRANES—ROLLERS

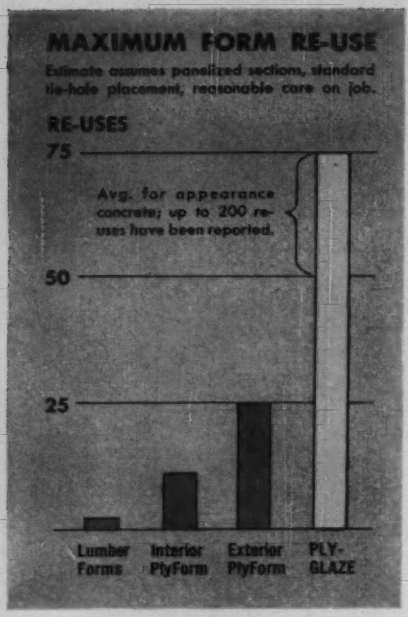
CLYDE

CLYDE IRON WORKS, INC.

Established in 1899

DULUTH 1, MINNESOTA

ONE OF THE 16 INTEGRATED COMPANIES BARIUM STEEL CORPORATION



On job after job, concrete form re-use records show...

BETTER "MILEAGE" with PLYGLAZE®

TAKE it from a firm that makes all three kinds of form materials:

Lumber forms are satisfactory (when neither re-use nor appearance count).

Plywood is much better. (Gives fair re-use, decent-looking concrete.)

PlyGlaze is best by far. (Gives most re-uses, very smoothest concrete.)

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Tacoma 2, Washington

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Please send free PlyGlaze literature.

Name.....

Address.....

City.....Zone....State.....

(Continued from page 112)

▲ **Jack Coleman,** 8646 Salem St., Dearborn, Mich. CA Est. $3,600,000. Sylvia Lanes Development 300 brick ranch HOUSES, Dearborn Twp., DEARBORN, MICH. Unity Realty Co., 15030 Wyoming St., Detroit 38, Mich.

Distin & Short, Inc., 13900 Harper St., Detroit 24, Mich. Owner Builds. $800,000. 75 brick ranch HOMES, Lake Drive and Greater Mack, DETROIT, MICH.

Frankel Brothers, 949 Woodlea St., Birmingham, Mich. Owner Builds. $750,000. FRANKLIN WOODS SUBDIVISION, 30 sites, 150x150 ft. up, FRANKLIN, MICH.

WEST OF MISSISSIPPI

BIDS ASKED—HEAVY CONSTRUCTION

† **Colo., Colorado Springs**—BA 6/1—U. S. Govt., Dpt. Air Force, 3333 N. El Paso St., Colorado Springs, primary road system Inv. No. (IFB) 05-613-55-1, Spec. AFA (1-55) A, at Air Force Academy, Skidmore, Owings & Merrill, 3333 N. El Paso St., engrs. CD 5/3, under LB.

Wyoming and Montana—TRANSMISSION LINES—BA 6/1—Shoshone River Power Co-operative, Cody, transmission line from Cody, Wyo. to Cooke City, Mont. $75,000. Associated Engineers, 1239 Lewis Ave., Billings, Mont., engrs. CD 11/1.

† **Colorado**—BA 6/16—Bureau Reclamation, Dpt. Interior, Loveland, earthwork, structures for South Platte Supply Canal, Firestone siphon, Station 1062 plus 40 to Station 1094 plus 55, Colorado Big Thompson Proj., in Firestone, Spec. DC 4426; adv. ENR 5/26.

† **Mo., St. Louis**—HAZARDOUS AREA—BA On Or About 6/24—U. S. Eng., 601 Davidson Bldg., Kansas City 8, Mo., rehabilitation, modification of No. 2 hazardous area, St. Louis Ordnance Plant, ENG-23-028-55-86. CD 10/19/53, under Public Buildings.

BIDS ASKED—BUILDINGS

Mo., Hillsboro—SCHOOL—BA 6/2—School Dist. R-III Jefferson Co., Bd. Educ., Warren M. Black, supt. Schools, 2 story, part ground floor, 92x93 ft., 60x108 ft. brick, masonry block, steel, concrete high school. $400,000. Bonsack & Pearce, Inc., 308 N. 6 St., St. Louis, Zone 1, archt. CD 3/1.

Mo., Frontenac (St. Louis 24 P.O.)—PROVINCIALATE—BA 6/6—Sisters of Mercy, c/o Mother M. Bernardo Mulligan, mother provincial, St. Joseph's Convent, 723 S. Laclede Station Rd., Webster Groves, Zone 19, provincialate (Mother House) consisting of W-shaped main bldg., chapel, boiler room, residence and educational facilities, Geyer Rd. between Clayton and Mancteser Rds. $350,000. Barnard McMahon, 101 S. Meramec Ave., Clayton, Zone 5, archt. CD 8/9.

Minn., Renville—SCHOOL—BA 6/7—Bd. Educ., J. H. Smith, clk., school addn. $500,000, Pass & Rockey, Mankato, archts. CD 12/14.

Minn., Kiester—SCHOOL—BA 6/15—Bd. Educ., Independent School Dist. 67, Joint, Faribault and Freeborn Counties, M. Yankey, clk., high school addn. $550,000. Plans deposit $30, H. H. Swanson, 500 Sexton Bldg., archt. CD 11/30.

▲† **N. M., Los Alamos**—LABORATORY—BA 6/24—U. S. Atomic Energy Comn., Los Alamos, radiochemistry laboratory, Inv. 291-55-8. $1,200,000-$1,400,000.

Tex., Houston—ENGINEERING and GEOLOGICAL—Bids Asked—Michael T. Halbouty, Shell Bldg., engineering and geological. $350,000. Wylie W. Vale, 517 W. Gray St., archt. CD 5/3.

HEAVY CONSTRUCTION

LOW BIDS AND CONTRACTS

Steenberg Constr. Co., 1371 Marshall Ave., St. Paul, Minn. CA $204,931. sewage treatment plant, HASTINGS, MINN. City, A. J. Gergen, clk., Hastings, Minn. Bids May 10. CD 4/6.

A. J. Stevens Co., 2549 Bryant Ave. S., Minneapolis, Minn. CA $136,206. concrete sidewalk, concrete driveway, curb and gutter, MINNEAPOLIS, MINN. City, Bd. Park Comrs., G. R. Arneson, city purch. agt., 301 City Hall, Minneapolis, Minn. Bids Mar. 2.

▲ **Foley Bros.,** New York Bldg., St. Paul, Minn. LB $1,894,767. water treatment plant, 9 m.g. capacity, new river intake, raw-water pumping station, ST. CLOUD, MINN. City, A. J. Haberkorn, clk. St. Cloud, Minn. Bids May 10. CD 4/5.

IOWA—State Hy. Comn., Ames,

Hallett Constr. Co., Crosby, Minn., CA, $559,254 c. conc. 9.609 mi. Special IN-340 (18) Dallas Co. Bids May 3. CD 5/6, under LB.

Welden Bros., Iowa Falls, Iowa, CA $84,750 sewage treatment imprvs., Mental Health Institutes, INDEPENDENCE, IOWA. State Bd. Control, Des Moines, Iowa. Bids Apr. 19. Ralph Arnold, Des Moines, Iowa, state archt. H. R. Green Co., 417 1 Ave. S.E., Cedar Rapids, Iowa, engr.

Lippert Brothers, Inc., 827 Monona St., Boone, Iowa, CA $107,800. sewage treatment imprvs. Mental Health Institute, INDEPENDENCE, IOWA. State Bd. Control, Des Moines, Iowa. Bids Apr. 19. Ralph Arnold, Des Moines, Iowa, state archt. H. R. Green Co., 417 1 Ave. S.E., Cedar Rapids, Iowa, engr.

S. Patti Constr. Co., 1340 Admiral St., Kansas City, Mo. CA $959,000. Water Dpt. Contr. No. C-125, Final Basin No. 3, KANSAS CITY, MO. City, Water Dpt., City Hall, Kansas City, Mo. CD 4/29, under LB.

▲† **Foley Bros., Inc.,** New York Bldg., St. Paul, Minn., **Winston Bros. Co.,** Northwestern Bank Bldg., Minneapolis, Minn., **Donovan Constr. Co.,** 1725 Carroll Ave., St. Paul Minn., **C. F. Lytle Co.,** 250 Insurance Exchange Bldg., Sioux City, Iowa and **Missouri Valley Constr. Co.,** Box 801, Leavenworth, Kan., CA $5,823,292, outlet works, Stage III, downstream tunnels, Oahe

(Continued on page 117)

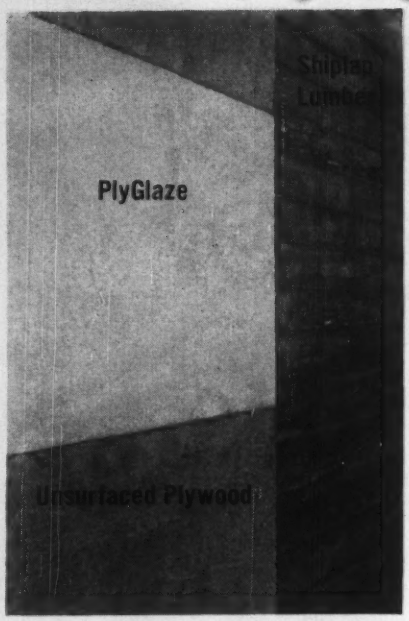
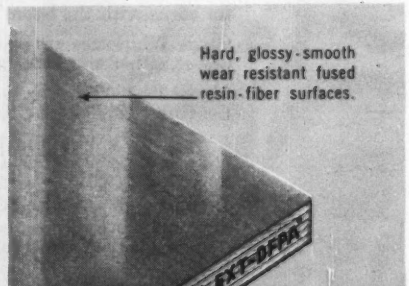


Photo taken right after stripping forms proves that you get the...

FINEST SURFACE with PLYGLAZE®

READ "finest" both ways: PlyGlaze *itself* has the finest, smoothest surface of any form material; PlyGlaze-formed *concrete* surfaces are the finest—smooth, even-textured, with no trace of grain pattern. Savings on finishing costs alone frequently offset slightly higher cost of this premium material. See Sweet's File or use coupon for more information.

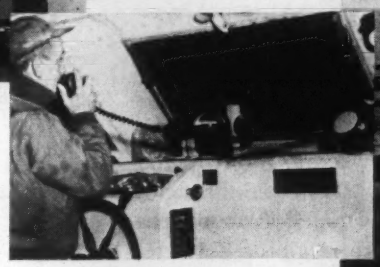
ST. PAUL & TACOMA LUMBER CO.
Tacoma 2, Washington


Hard, glossy-smooth wear resistant fused resin-fiber surfaces.
TREE LIFE PLYGLAZE EXT-DFPA
Top-quality Exterior plywood (EXT-DFPA). Standard panel sizes.

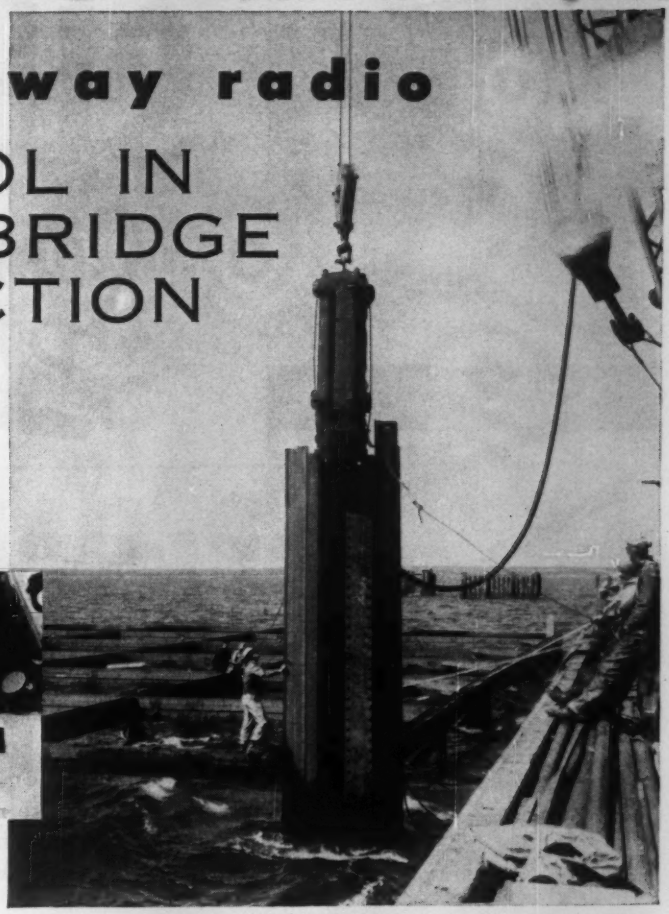
Motorola 2-way radio

VITAL TOOL IN MACKINAC BRIDGE CONSTRUCTION

Supervisors have constant contact with all operations.



Boats are radioed orders from shore, saving travel time.



HERE'S HOW 2-WAY RADIO SPEEDS THE WORK

Tying in all the working forces building the giant 5-mile bridge across the Straits of Mackinac was a big task, but 38 Motorola 2-way radio units did the job successfully.

Floating derricks, job tugs, personnel boats, trucks, autos and land based stations—all are a few seconds away from each other with radio. Supervisors do a full-time job, transmitting new orders immediately and receiving important messages—in the auto, office, or on the water:

Adverse weather, wind and current reports are flashed instantly to off-shore crews . . . these same crews can radio and get quick help if injuries occur. In these, and a dozen other ways, Motorola radio is enabling the impossible — faster and at less cost.

HERE'S WHY *ONLY* MOTOROLA COULD DO IT SO WELL

VERSATILE: Motorola produces the greatest variety of 2-way radio equipment available . . . portable, mobile and base station equipment were combined for the Mackinac Project to form a custom-made system at production line prices.

RUGGED: Motorola equipment is built to take the severe beating that any construction work imposes on it . . . to deliver when needed most. Motorola radio has been proven in use to *outlive* any other.

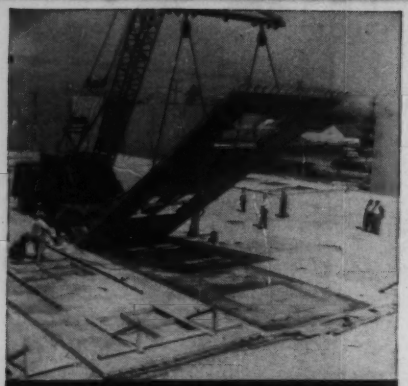
EXCLUSIVE FEATURES: The pioneer and leader, Motorola, offers more *exclusive* advantages and features than any other 2-way radio found anywhere.

SERVICE: A Motorola Service Station a few miles from the Mackinac Project stands ready for prompt, efficient maintenance. Motorola offers the most complete national service set-up—650 Authorized Service Stations, strategically located and on call 24 hours a day . . . assuring the fastest, most dependable service available.

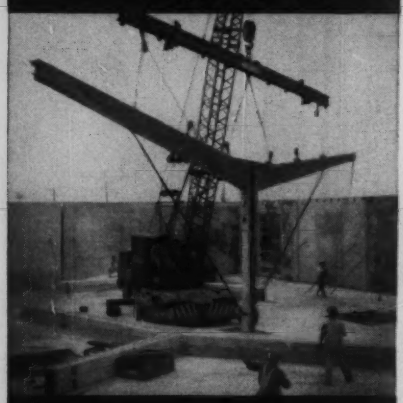
Motorola
2-WAY RADIO

Motorola Communications & Electronics, Inc.
A SUBSIDIARY OF MOTOROLA INC.
4501 AUGUSTA BOULEVARD CHICAGO 51 ILLINOIS
ROGERS MAJESTIC ELECTRONICS LTD TORONTO CANADA

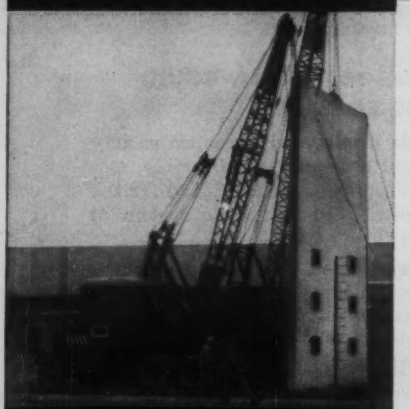
Motorola consistently supplies more mobile radio than all others combined—
proof of acceptance, experience and quality.
The only COMPLETE radio communications service—
specialized engineering . . . product . . . customer service . . . parts . . . installation . . . maintenance . . . finance.
"The best costs you less—specify Motorola".



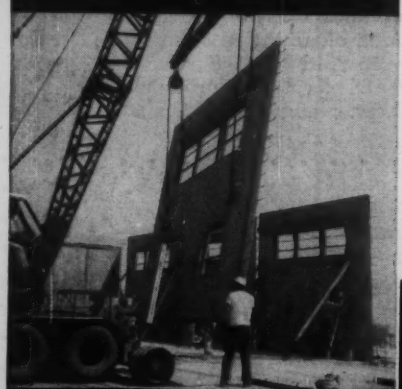
PRECAST PANEL 32' high, 18½' wide with two large window areas.



TRUSS has 60' span at top



114,000 LB. SLAB being positioned



PANEL with door and two window areas

SUPERIOR

Complete Accessories Plus Experience on Tilt-Up Jobs!

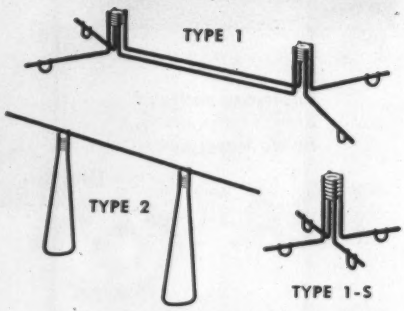
On every Tilt-Up job the proper type of Pick-Up Inserts and Brace Anchors as well as their location in the slab or precast structural member are of prime importance in order to withstand the stresses occurring when *tilting, lifting,* and *positioning.* As pioneers in this field, SUPERIOR has developed various types of accessories and correct procedures resulting from the experience of thousands of job applications.

SUPERIOR accessories are designed for fast and efficient handling of all types of precast panels and structural members. The Pick-Up Insert provides dependable anchorage for bolts which secure a lifting angle to which slings are attached when the panel is raised. Brace Anchors secure the temporary bolts by which the Braces are attached. The exclusive pivoting action of the adjustable Braces permits quick positioning and alignment of panels. Braces are assembled with 2 x 4's or pipe of lengths to fit job conditions.

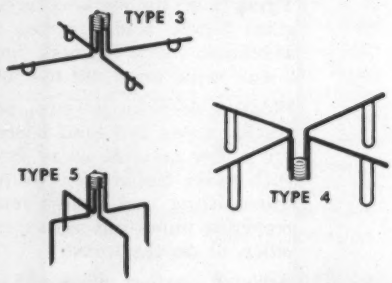
The many types of SUPERIOR Inserts, Anchors, and Braces for every job condition together with complete layout service provide a combination which offers safe and efficient handling of precast panels and structural members.

For complete details request a copy of BULLETIN TU-2.

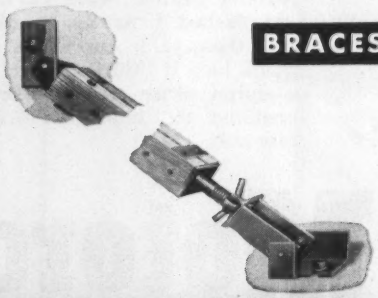
PICK-UP INSERTS



ANCHORS for BRACES



BRACES



SUPERIOR CONCRETE ACCESSORIES, INC.

4110 Wrightwood Avenue, Chicago 39, Illinois

New York Office
1775 Broadway, New York 19, N. Y.

Pacific Coast Plant
2100 Williams St., San Leandro, Calif.

(Continued from page 114)

Reservoir Proj., near Pierre, Inv. 25-066-55-89, SOUTH DAKOTA. U. S. Eng., 1709 Jackson St., Omaha, Neb. Bids May 3. CD 5/6, under LB.

† **Milo J. Choate & Co., Inc.**, Tyler, Tex., LB $107,974, est. $101,953, dental clinic, Abilene Air Force Base, ENG-41-443-55-110, ABILENE, TEX. U. S. Eng., 100 W. Vickery Blvd., Forth Worth, Tex. Bids May 11. CD 4/20.

Mitchell Darby Constr. Co., Pharr, Tex., LB $124,740, est. $135,000, water exten., imprvs., ARANSAS PASS, TEX. City, c/o mayor, Aransas Pass, Tex. Bids May 3. CD 4/14.

Lake Alaska, Inc., c/o Jack Miller, 7002 Mykawa St., Houston, Tex., Own Forces. $47,117, c.i. water lines, facilities, CHENANGO, TEX.

Lake Alaska, Inc., c/o Jack Miller, 7002 Mykawa St., Houston, Tex. Own Forces. $77,115, storm sewers, CHENANGO, TEX. CD 5/3.

Lake Alaska, Inc., c/o Jack Miller, 7002 Mykawa St., Houston, Tex. Own Forces. $45,000, bldg. area earthwork, grading, CHENANGO, TEX.

Cribbs Brothers, Contractors, 7002 Mykawa St., Houston, Tex., CA $79,185, asphalt paved streets, concrete curb and gutter, CHENANGO, TEX. Lake Alaska, Inc., c/o Jack Miller, 7002 Mykawa St., Houston, Tex.

Cribbs Brothers, Contractors, 7002 Mykawa St., Houston, Tex, CA $75,000, sanitary sewers, CHENANGO, TEX. Lake Alaska, Inc., c/o Jack Miller, 7002 Mykawa St., Houston, Tex. CD 5/3.

Slovak Bros., Inc., Box 5096, Corpus Christi, Tex. LB $500,874, est. $100,000. water sys. addns., CLARKWOOD, TEX. Nueces County Fresh Water Supply Dist. No. 1, C. F. Payne, chn., Clarkwood, Tex. Blucher & Naismith, Inc., 128 Mesquite St., Corpus Christi, Tex. engr. Bids May 7.

Austin Bridge Co., 1000 Singleton St., Dallas, Tex. CA $577,616. overpass, Marsalis St., DALLAS, TEX. City, City Hall, Main and Harwood Sts., Dallas, Tex. Bids May 2. CD 5/11, under LB.

† **Lippert Brothers**, Box 8305, Denver, Colo., CA $683,442, guard hangar, NOY 84347, Spec. 44002, DENVER, COLO. Dpt. Navy, Bldg. 1-A, Great Lakes, Ill. Bids Apr. 28, awarded Apr. 29. CD 1/23/53.

Engineers Ltd. Pipelines & C. V. Miller Co., 2040 S. Navajo St., Denver, Colo., LB $76,578, est. $78,000. installing Main St. Louis collection conduit, Fraser, DENVER, COLO. Bd. Water Comrs., City & County Bldg., Denver, Colo. Bids May 10. CD 5/3.

Engineers Ltd. Pipelines & C. V. Miller Co., 2040 S. Navajo St., Denver, Colo., LB $82,167, est. $100,213. installing East St. Louis Collection Conduit, Fraser, Denver, COLO. Bd. Water Comrs., City & County Bldg., Denver, Colo. Bids May 9. CD 5/3.

BUILDINGS

LOW BIDS AND CONTRACTS

Langer & Assocs. Inc., 225 Jewett Bldg., Des Moines, Iowa., CA $381,580, general contract, Junior-Senior High SCHOOL, DES MOINES, IOWA. Saydel Consolidated School Dist. E. 14 and Broadway, Des Moines, Iowa. Bids Apr. 27. CD 4/22.

Hagstrom Constr. Co., 1567 Selby Ave., St. Paul, Minn. LB $617,942. general contract 3 grade SCHOOL BLDGS. BRAINERD, MINN. Bd. Educ., Mrs. J. A. Thabes, clk., Brainerd, Minn. Swanson, Matson & Wegleitner, 500 Sexton Bldg., Minneapolis, archts. Bids May 12. CD 4/5.

Thomas Constr. Co., Schneider Bldg., St. Joseph, Mo. CA $464,905. general contract Nurses' HOME, ST. JOSEPH, MO. Missouri Methodist Hospital, Ninth and Faraon Sts., St. Joseph, Mo. Bids Apr. 26. CD 12/10.

▲ **Bowers Constr. Co.**, 627 College St., Topeka, Kan. Owner Builds. $2,000,000. 200 DWELLINGS "The Village" location west of Fairlawn, TOPEKA, KAN. Glenn Horst, 1929 Quivera St., Topeka, Kan., designer.

M. K. Eby Constr., Co., 610 N. Main St., Wichita, Kan. CA $900,375. general contract Truesdell Intermediate SCHOOL, WICHITA, KAN. Bd. Educ., 428 S. Broadway, Wichita, Kan. Bids May 2. CD 4/5.

Fish Engineering Corp., M & M Bldg., Houston, Tex., CA Approx. $875,000, casinghead gas processing PLANT unit, near Palestine, Anderson and Cherokee Counties, TEXAS. Humble Oil & Refining Co., Humble Bldg., Houston, Tex. CD 2/3/53, under Unclassified.

G. Sargi, Kyle Bldg., Beaumont, Tex., CA $975,000. SHOPPING CENTER, BEAUMONT, TEX. Beaumont Village Co., J. H. McNaughton, Trustee, Beaumont, Tex. CD 4/11.

Bradshaw & Puryear, 103 Brazos St., Austin, Tex. LB $90,800, BOILER PLANT imprvs., BIG SPRING, TEX. Bd. for Texas State Hospitals & Special Schools, 4405 Lamar Blvd., Austin, Tex. Bids Apr. 28.

Tanner H. Freeman, Jr., 1001 Peerman St., Corpus Christi, Tex., CA $464,000, OFFICE bldg. addn., remodeling, CORPUS CHRISTI, TEX. Central Power & Light Co., 120 N. Chaparral St., Corpus Christi, Tex. CD 3/10.

Cain, Brogdon & Cain, 2333 Grafton St., Fort Worth, Tex., LB $529,400, Base 1; LB $314,300, Base 2, for COURT HOUSE alterations, addns., FORT WORTH, TEX. Tarrant Co., c/o Gus Brown, judge, Court House, Fort Worth, Tex., Wyatt C. Hedrick Co., 1200 T & P Bldg., Fort Worth, Tex. archt. Bids May 9.

O. P. Leonard, 200 Houston St., Fort Worth, Tex. Owner Builds. $100,000. AUTO BLDG., FORT WORTH, TEX. CD 5/4.

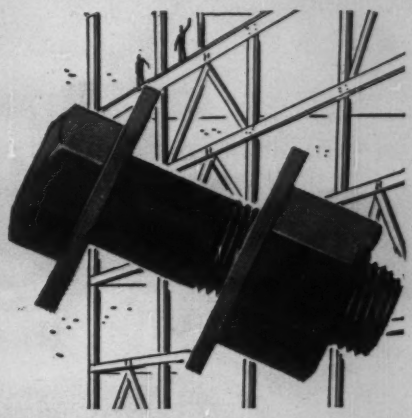
Tellepsen Constr. Co., 1710 Telephone Rd., Houston, Tex. CA $358,000. integrated STORES unit, FREEPORT, TEX. Freeport Land Co., c/o Dan M. Moody, Abstract & Title Bldg., Houston, Tex. CD 5/5.

Spartan Constr. Co., Box 14397, Houston, Tex. LB $416,557, est. $400.000. Southwest Bellaire area

(Continued on page 120)

Because...

NO BOLT is ANY BETTER THAN ITS WASHERS



It pays to Specify **MIL-CARB*** CARBURIZED **WASHERS** *TRADE MARK

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Today the swing in field assembly of structural steel joints is definitely toward *High Strength Bolting.* According to competent authorities who have had practical experience with this form of construction and evaluated its benefits, it is possible to *build better* and *build faster* by employing this method of joining steel members.

A primary essential, of course, is to use heat-treated, quenched and tempered bolts to produce a minimum ultimate strength of 120,000 psi for the usual size of bolt. At the same time, nuts must meet a proof load equivalent to the ultimate load of the bolts . . . *and the washers must be hardened, special quality steel.*

And because no bolt assembly is any better than its washers, consistent high-strength bolting should include the use of MIL-CARB Carburized Washers.

MIL-CARB Carburized Washers are fabricated from Prime Carburizing Quality Special Soundness Steel, which insures uniform quality control, always equal to the rigid specifications for this form of steel assembly (ASTM Designation A325, applying to bolts, nuts and washers).

Additionally, MIL-CARB Washers overcome inherent weaknesses often present in heat-treated washers fabricated from steel of questionable quality.

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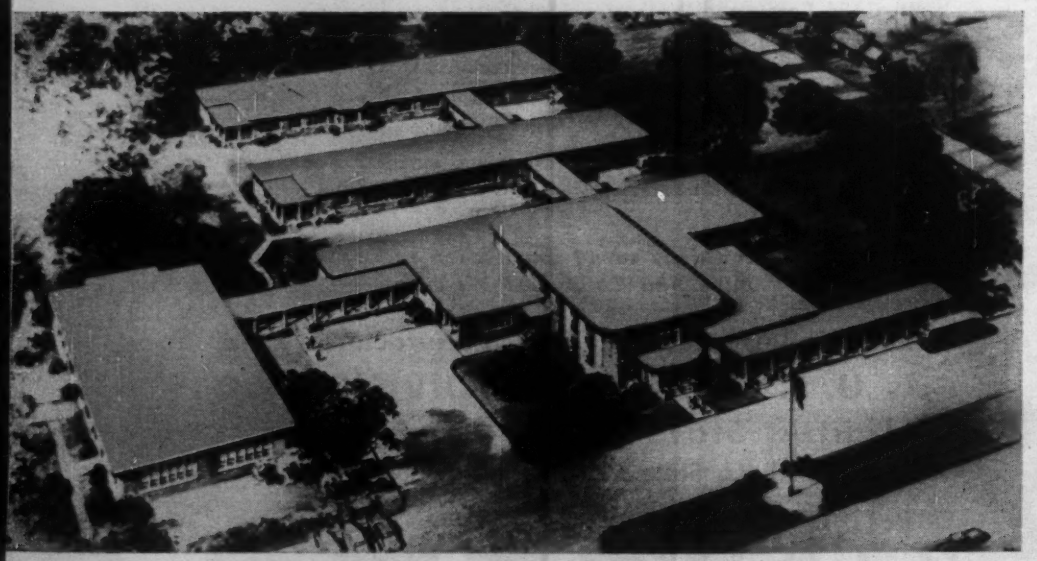
A 8000-2½

In Pittsburgh, Pa., the economy and labor saving features of Steeltex resulted in a decision to use Steeltex in the Roberts Elementary School in Penn Township. Architect: Joseph Hoover, A.I.A., Pittsburgh. Contractor: Branna Construction Corp., Pittsburgh.

Faster Construction At Lower Cost Makes STEELTEX® A Natural For New Schools

Construction is started on 20 new schools every working day in the year somewhere in the United States. Yet we can't keep up with the demands for more schools.

We will be 176,000 classrooms short of our needs by 1965 even at the present building rate. School officials trying to cope with this situation face a tough financing problem. Because it's hard for them to get the money they need to build new schools, they must get the greatest possible value for every dollar they spend.



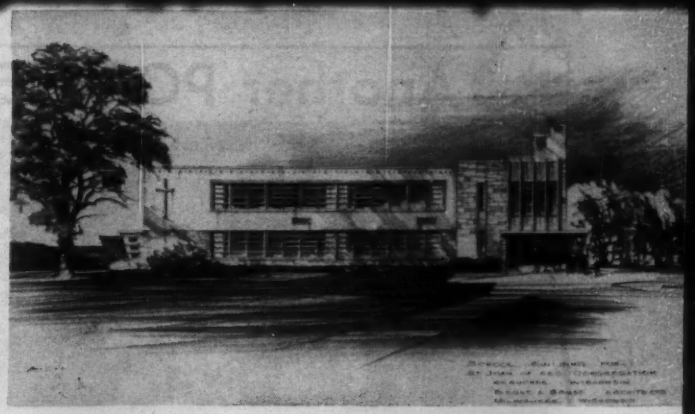
In Brownsville, Fla., cost of construction was a big factor in building junior high school. Steeltex helped stretch construction dollars. Architect: Frank Sindelar, A.I.A., Pensacola, Fla. Contractor: E. M. Hall Construction Co., Pensacola.

Pressure is on architects and contractors to use better materials which provide savings and speed construction of well-designed, sturdily-built schools. That's one big reason why more and more Pittsburgh Steeltex is being used for reinforcing in floors and roofs—it provides a better construction job faster and at lower cost.

Steeltex, the wire mesh lath which carries its own form right on its back, was the choice of architects and contractors for the representative new schools pictured on these pages. These jobs are typical of large and small public and parochial schools in all parts of the country which are being built with Steeltex because it helps answer the all-important question: "How can we make the best possible use of the limited funds available?"

The men responsible for designing and building these school buildings have this to say about Steeltex:

In Ann Arbor, Mich., a new $6.5 million high school used Steeltex for about 300,000 square feet of floors and roof decks. Architect: Fulton, Krinsky & Dela Motte, Cleveland, Ohio. Contractor: Sorensen-Gross Construction Co., Flint, Mich.



In Okauchee, Wisc., good design and sturdy construction were the keynotes of the St. Joan of Arc School. Steeltex went into all floors. Architect: Brust & Brust, Milwaukee. Contractor: Oliver Construction Co., Oconomowoc, Wisc.

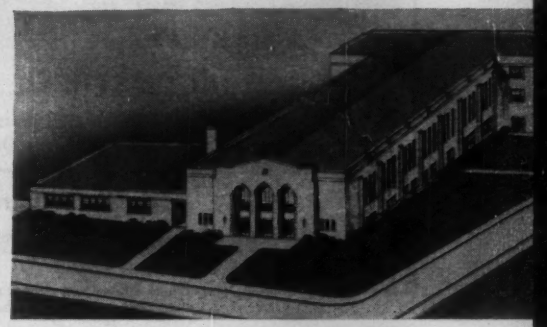
Architect: "Steeltex gets credit for contributing to a very low construction cost—$1 per cubic foot. Construction with Steeltex is faster, easier, without leak-through; the slab is stronger and the weight distribution is more even. Use of Steeltex helped us meet the budget requirements of our client. It is an ideal form for concrete floors and suspended decks."

Contractor: "We used Steeltex because it is low in cost, is easy to handle and provides strong floors which can be built faster. Steeltex cut our floor construction costs by approximately 20 per cent. It is economical to install, makes forms unnecessary, and is readily available. The water resistant backing on Pittsburgh Steeltex holds the water in the concrete and prevents drip, maintaining the proper ratio of the mix and permitting the concrete to cure uniformly."

School Board Official: "We conferred with our architect and contractor and learned that Steeltex would reduce the cost of our school substantially if we used Steeltex instead of a more costly type of steel flooring. We were still able to maintain exacting high standards which we had originally established. We changed our plans and used Steeltex to take advantage of this real saving. Steeltex was a bargain for us."

Wherever the construction dollar must be stretched without sacrificing quality construction, Steeltex can help. If your plans call for construction of a school or any other project with poured concrete floors, roofs, plaster walls or ceilings, or Portland cement (Stucco) exteriors, there is a special type of Pittsburgh Steeltex that can do a better job for you faster at lower cost.

Steeltex offers you the same advantages enjoyed by the designers and builders of the schools pictured here. Call the nearest district sales office to learn how you can do a better job faster with Steeltex. Or you can write to Pittsburgh Steel Products Co. for a free copy of the Steeltex book.



In Cheltenham, Pa., near Philadelphia, speed of installation and economy made Steeltex a good choice for the St. Joseph School and Church. Architect: Gleeson and Mulrooney, Philadelphia. Contractor: James J. Clearkin Co., Philadelphia.

Send for your copy of "Pittsburgh Steeltex—Backbone Of Concrete, Plaster, Mortar."

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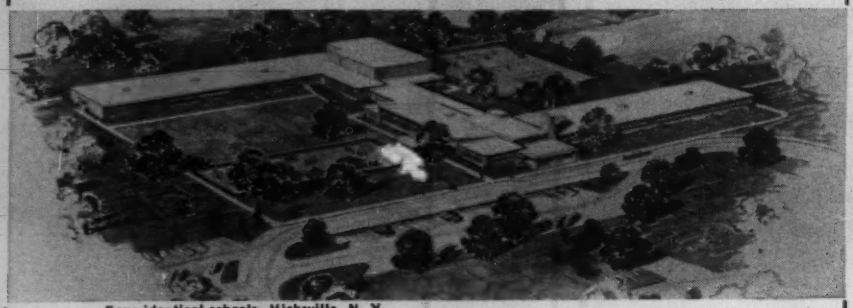
Another POREX Roof



Four identical schools, Hicksville, N. Y.
Architect: Knappe & Johnson, New York City
Contractors: Gundersen Const. Co., Lynbrook, N. Y., Arthur S. Kock, Huntington, N. Y.

POREX ROOF DECKS PROVIDE

★ HEAT INSULATION (U-O. 15 Btu.)
★ LIGHT WEIGHT (Only 15 lbs. per sq. ft.)
★ SOUND CONTROL (Noise Red. Coef. 70)
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3233 W. Grand Ave., Chicago 51, Illinois

(Contnued from page 117)

Elementary SCHOOL, S. 12 and Pine Sts., near Bellaire, HOUSTON, TEX. Houston Independent School Dist., 1300 Capitol St., Houston, Tex. Bids May 5. CD 4/25.

Candoo Constr. Co., Inc., Box 14266, Houston, Tex., CA $418,295. 5 story bsmnt., steel OFFICE, HOUSTON, TEX. L & R Building Corp., c/o Lucian T. Hood & Lars Bang, archts., 1612 Bissonnet St., Houston, Tex., or c/o Lionel J. Ellis & Co., Southern Title Bldg., Houston, Tex. I. A. Naman & E. W. McMillan, 3305 Montrose St., Houston, Tex., engrs. Bids May 17.

Texas Foundries, Inc., Lufkin, Tex. Own Forces. $875,000, steel FOUNDRY expansion; $100,000, WAREHOUSING or STORAGE, LUFKIN, TEX. CD 4/14.

FAR WEST

BIDS ASKED—HEAVY CONSTRUCTION

† Oregon—CLEARING RIGHT-OF WAY—BA 6/3—Bonneville Power Admin., 1001 N. E. Lloyd Blvd., Portland, clear right of way and constr. access roads for Sandy-Oregon City sections of Big Eddy-Oregon City and Big Eddy-Bethany lines, clear site for Oregon City sub-station 30.5 mi. Clackamas Co., Inv. 7667. Plans deposit $5.

† Washington—BA 6/7—Bureau Reclamation, Dpt. Interior, Denver Federal Center, Denver, Colo. 2 revolving fish screens and two motorized drive units for fish screen structure, Chandler canal enlargement, Yakima Proj., Kennewick Div., Spec. DS-4422. L. N. McClellan, ch. engr.

▲ Calif., El Centro—BA 6/8—City, 561 State St., water treatment plant, appurtenances. $1,000,000. Extended date. CD 5/3.

† Wash., Camp Hanford—BA 6/9—U. S. Eng., City-County Airport, Walla Walla, road construction ENG-45-164-55-33. Plans deposit $50. CD 5/29/52.

† Idaho—AUTOTRANSFORMERS, ect.—BA 7/7—Bureau Reclamation, Dpt. Interior, Denver Federal Center, Denver, Colo., Sch. 1, two outdoor autotransformers for Goshen Sub-station Spec. DS 4423. L. N. McClellan, c/o owner ch. engr. CD 9/14/44, under Earthwork, waterways.

BIDS ASKED—BUILDINGS

† Wash., Tacoma—SHOP—BA 6/8—U. S. Eng., 4735 E. Marginal Way, Seattle, Zone 4, 45,000 sq. ft., rein.-con., masonry, steel frame depot maintenance shop with integrated fire control sys., Mount Rainier Ordnance Depot, ENG-45-108-55-233.

HEAVY CONSTRUCTION

LOW BIDS AND CONTRACTS

IDAHO—State Hy. Dpt., Boise,
Idaho—Western Constr. Co., 1695 Yellowstone Ave., Pocatello, Idaho, CA, $92,222 roadway, roadmix bit. surf. 5.567 mi. Blackfoot-East Rd., Bingham Co.;
Idaho—Winn & Co., Buhl, Idaho, CA, $97,791 roadway 3.496 mi., bit. surf. 6.326 mi. Gem Co. Bids Apr. 26. CD 4/19.

Kirkland Sand & Gravel Co., Kirkland, Wash., CA, $200,000. primary sewage treatment plant and sewerage sys. at aluminum plant, VANCOUVER, WASH. Aluminum Co. of America, Alcoa Bldg., Pittsburgh, Pa.

† Westinghouse Electric Co., 309 S.W. Sixth Ave., Portland, Ore., CA $274,485, switchboards for The Dalles Dam, Fishwater Units, OREGON. U. S. Eng., 628 Pittock Block, Portland, Ore. CD 2/24, under LB.

Carlson Constr. Co., Baker, Ore., CA $193,105, 43.46 mi. 69-kv line, 5,000-kva sub-station, Lake Co., OREGON. Mid-State Electric Co-operative, Lapine, Ore. Bids May 5. CD 4/18.

Gibbons & Reed, 6855 N.E. Halsey St., Portland, Ore., LB $325,578, grading, draining 300-acres Portland International Airport, PORTLAND, ORE. Port of Portland, Box 4099, Swan Island, Portland, Ore. Bids May 6. CD 4/19.

Lee Hoffman, 415 N.W. Cedar St., Beaverton, Ore., LB $100,242. water reservoir and pipe line, WEST SLOPE, ORE. West Slope Water Dit., 9025 S.W. Canyon Rd., Portland, Ore. CD 11/10.

CALIFORNIA—State Div. Hys., P. Wks. Bldg. Sacramento,
Eaton & Smith, 1215 Michigan St., San Francisco, Calif., CA, $601,032, grading, surf. 3.6 mi. U. S. 299 near near Montgomery Creek, Shasta Co. Bids Apr. 27, awarded May 9. CD 5/3, under LB.

CALIFORNIA—Div. Hys., 1120 N St., Sacramento,
J. H. Pomeroy & Co., Inc., 333 Montgomery St., San Francisco, Calif., CA, $844,344, 8 rein.-con. piers on steel piles, 17 structural spans, 11 structural spans at pier locations for Richmond-San Rafael Bridge, Richmond, Contra Costa Co. Awarded May 12. CD 11/4.

† Edward R. Siple Co., 2545 San Fernando Rd., Los Angeles 65, Calif., CA, $83,410. 2 supply warehouses for experimental rocket engine test station, Edwards Air Force Base, ENG-04-353-55-115, MUROC, CALIF. U. S. Eng., 751 S. Figueroa St., Los Angeles, Calif. Bids Apr. 7.

BUILDINGS

LOW BIDS AND CONTRACTS

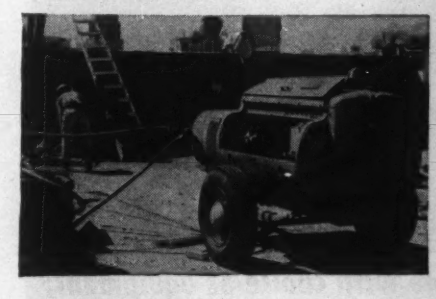
Haddock Engineers Ltd., Securities Bldg., Seattle 1, Wash., CA, $719,973 2 story, bsmnt. Branch BANK, SEATTLE, WASH. National Bank of Commerce, 2 and Spring Sts., Seattle, Wash. CD 3/9, under LB.

▲ Deschutes School Dist. No. 1, Bend, Ore., rejected bids May 5, rein.-con. HIGH SCHOOL, BEND, ORE. LB $1,200,000. CD 4/13.

(Continued on page 122)

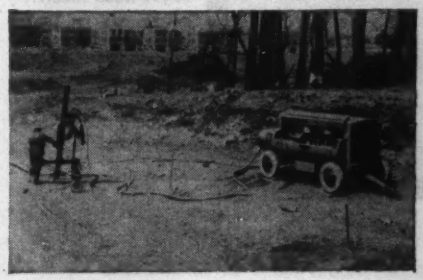
Two "600" portables at work on a mountain road job.

Three "600" compressors used on the New York Thruway.

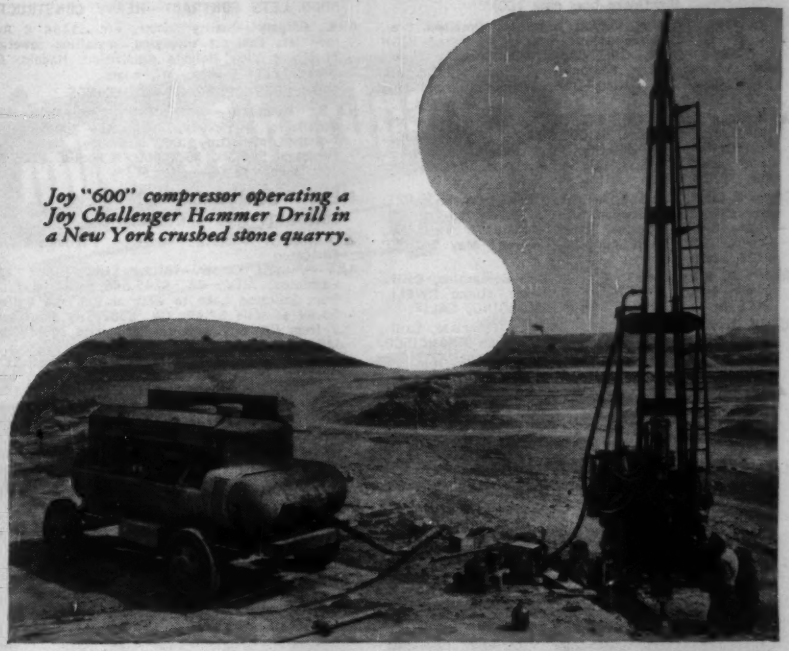


A "125" operating on roof of a Dallas skyscraper.

This "315" powers paving breakers on a Pittsburgh construction job.



A "600" with Joy Wagon Drills on a Philadelphia housing project.



Joy "600" compressor operating a Joy Challenger Hammer Drill in a New York crushed stone quarry.

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You'll find Joy Portable Compressors on a variety of jobs, in all parts of the world. Check the owners . . . you'll get reports of consistently fine performance and complete dependability from the tried and true design.

Joy's background of 45 years in the portable compressor field has paid off in the development of these many fine features found in all Joy portables:

FOR PERFORMANCE Low-lift, large port-area, "direct-concentric" valves. Efficient air cooling, cross-flow intercoolers, matched engines, full force-feed lubrication to every bearing and working surface.

FOR DEPENDABILITY Oversize receivers, main bearings and starting equipment. Three-point engine-compressor suspension, rifle-drilled connecting rods and lightweight pistons. Welded steel frames and "bulkhead" body construction.

Five sizes are available—from 75 to 600 cfm. For details on how you, too, can benefit from Joy's field-proved design, write for free bulletin #A-55, to **Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario*

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CONSTRUCTION EQUIPMENT MANUFACTURERS
FOR OVER HALF A CENTURY

(Continued from page 120)

James S. Hickeys, Inc., 523 S. Stark St., Portland, Ore., CA $417,102, combination ELEMENTARY and HIGH SCHOOL, DUFUR, ORE. Dufur School Dist., Dufur, Ore., Warren Weber, Fenton Bldg., Portland, Ore. and Boyd Jossy, The Dalles, Ore., archts. Awarded May 8. CD 11/18.

▲ Hoffman Constr. Co., 715 S.W. Columbia St., Portland, Ore., CA, Est. $1,000,000. 11 story OFFICE, PORTLAND, ORE. Pacific First Federal Savings & Loan Assn., 811 S.W. 6th St., Portland, Ore. Awarded May 9. CD 6/1.

Taylor & Clark, Box 548, Arlington, Calif., CA, $538,921, est. $550,000 Workman SCHOOL, West Covina, COVINA, CALIF. Covina School Dist., 475 N. 2 St., Covina, Calif. Bids Apr. 18, awarded May 10. CD 4/28, under LB.

Robert P. Bruce, 1863 "E" St., San Bernardino, Calif., Owner Builds, $487,820. 81 frame, stucco DWELLINGS in Tract 3996, SAN BERNARDINO, CALIF.

Cahill Brothers, 350 Sansome St., San Francisco, Calif., CA, $758,000. OFFICE alterations, SAN FRANCISCO, CALIF. Market-Front Co., 350 Sansome St., San Francisco, CaMf.

▲ Johnson Drake & Piper, 9009 San Leandro St., Oakland, Calif., LB, $2,294,300, 2nd phase Units 4 and 5, CALIFORNIA MEDICAL FACILITY, VACAVILLE, CALIF. State Div. Architecture, P. Wks. Bldg., Sacramento, Calif. Bids May 10. CD 4/21.

Louis C. Dunn, Inc., Monadrock Bldg., San Francisco, Calif., CA, $990,000, 3 story STORE addn., 8353 Van Nuys Blvd., VAN NUYS, CALIF. Panorama City Shopping Center, 14418 Chase St., Van Nuys, Calif. Welton Becket & Assoc., 5657 Wilshire Blvd., Los Angeles, Calif., archts.

Jackson Brothers, 3475 W. 8 St., Los Angeles, Calif., CA, $450,000. 21,500 sq. ft., rein.-con. STORE, WHITTIER, CALIF. Myers Department Store, 201 N. Greenlief St., Whittier, Calif.

CANADA

BIDS ASKED—HEAVY CONSTRUCTION

B. C., Westview—BA 5/31—Village, Village Hall, installing 54,000 ft. 8- to 12-in. sewer mains, constr. 168 manholes, installing 400 service connections and constr. 1,500 ft. ocean outfall line. Plans deposit $25. Associated Engineering Services, Ltd., 1934 W. Broadway, Vancouver, engrs.

British Columbia—BA 6/9—Pacific Great Eastern Ry. Co., B. E. Valde, ch. engr. Squamish, railway bridge over Fraser River at Mile 0.93 and railway bridge over Salmon River at Mile 14.87 north of Prince George. Plans deposit $75. CD 2/12/54.

SOON LETS CONTRACT—HEAVY CONSTRUCTON

Alta., Calgary—Quality Constr. Ltd., 1134 8 Ave. W., soon lets contract supplying, installing sewerage sys. in Mount View Heights subdivision. Haddin, Davis & Brown, 1134 8 Ave., W., engrs.

SOON LETS CONTRACT—BUILDINGS

N. B., Humphrey—MONESTARY, etc.—Rev. Frs. Redempteurs, Humphrey, soon lets contract 4 story T-shaped monestary and seminaire, Notre Dame de Perpetual Socours, $500,000. A Poulin, 1115 Prospect St., Shebrooke, Que., archt.

HEAVY CONSTRUCTION

LOW BIDS AND CONTRACTS

▲ ALBERTA—Alberta Govt., Parliament Bldgs., Edmonton

Alta.—Piggott Constr. (Alta.) Ltd., 12522 126 St., Edmonton, Alta., CA, $245,646, grav. surf. Hy. 34 from Sturgeon Lake to west of Clarkson Valley, Mile 53.99 to Mile 62.49; CA, $382,878 grav. surf., Hy. 2 from Donnelly west to Springburn, Mile 204.05 to Mile 218.58;

Alta.—Standard Gravel & Surfacing, 5340 1 St. S. W. Calgary, Alta., CA, $686,376, stab. grav. base, Hy. 16 from Galloway to east of Pedley, Mile 148.86 to Mile 172.53; Grand total, $1,314,900. Awarded May 5. CD 12/1/43.

▲ W. C. Wells Constr. Co. Ltd., 10519 115 St., Edmonton, Alta. CA $1,360,000. sewage treatment plant, east of North Saskatchewah River, EDMONTON, ALTA. City, Civic Block, Edmonton, Alta. Bids May 2, awarded May 9, CD 5/13.

▲ ONTARIO—Dpt. Hys., Parliament Bldgs., Toronto,

Rayner Constr. Ltd., 29 Commercial Rd., Toronto, Ont., CA $1,246,005. Contract 55-22, c. conc. gran. base, 7 mi. Hy. 401 near Chatham, Awarded May 6. CD 5/11, under LB.

N. S. Pawliuk & Sons Ltd., 11244 50 St. Edmonton, Alta., LB, $99,700. supplying, installing 14,500 ft. 6 and 8 in. water pipe and necessary valves, hydrants and fittings, BEVERLY, ALTA. Town, Town Hall, Beverly, Alta. Associated Engineering Services, Ltd., 10250 106 St., Edmonton, Alta., engrs. CD 1/21.

BRITISH COLUMBIA—B. C. Govt., Douglas Bldg., Victoria,

B. C. Campbell-Bennett Ltd., 1718 W. 5 Ave., Vancouver, B. C., LB, $568,447, reconstr. 3.81 mi. Trans-Canada Hy. Arbutus Creek-Malahat Chalet Section, Proj 516;

B. C.—General Constr. Co., Ltd., Granville Island, Vancouver, B. C., LB $261,736, reconstr. 5.83 mi. Trans-Canada Hy., Cornwall Lodge Pumping Station Proj. 563. Bids May 3. CD 4/27.

T. C. Gorman Nova Scotia Ltd., 123 Roy Bldg., Halifax, N. S., CA, $977,800. jetty at R. C. N. Air Station, HARTSMOUTH, N. S. Dpt. P. Wks., Hunter Bldg., Ottawa, Ont. Bids Apr. 13. CD 4/20, under LB.

BUILDINGS

LOW BIDS AND CONTRACTS

Glengary Constr. Co. Ltd., 103 40 112 St., Edmonton, Alta., Owner Builds, $413,000, 57 frame, stucco DWELLINGS, Elm Park Subdivision, EDMONTON, ALTA. Awarded May 6.

G. W. Golden Constr. Co., Ltd., 8925 82 Ave., Edmonton, Alta. Owner Builds. $850,000. 94 frame, stucco DWELLINGS, EDMONTON, ALTA. Awarded May 6.

A. R. Grimwood Ltd., 1129 Kingsway, Vancouver, B. C., CA, $482,000. 46,200 sq. ft., concrete, steel MUNICIPAL HALL, BURNABY, B. C. Burnaby Municipality, Municipal Hall, Burnaby, B. C. Bids Apr. 25, awarded May 5. CD 4/13.

Jarvis Constr. Co. Ltd., 175 E. Broadway, Vancouver, B. C., CA, $500,000, 2 story, frame, concrete 32-room HOTEL, RICHMOND, B. C. Owner, c/o 3745 Kingsway, Burnaby, B. C. S. Collins, 3745 Kingsway Burnaby, B. C. archt. Awarded May 7.

Commonwealth Constr. Co., Ltd., 700 Taylor St., Vancouver, B. C., CA, $594,136. 5 story, concrete, brick HOSPITAL addn., VANCOUVER, B. C. St. Joseph's Hospital, Prince Edward St., Vancouver, B. C. Bids Apr. 27, awarded May 6. CD 4/13.

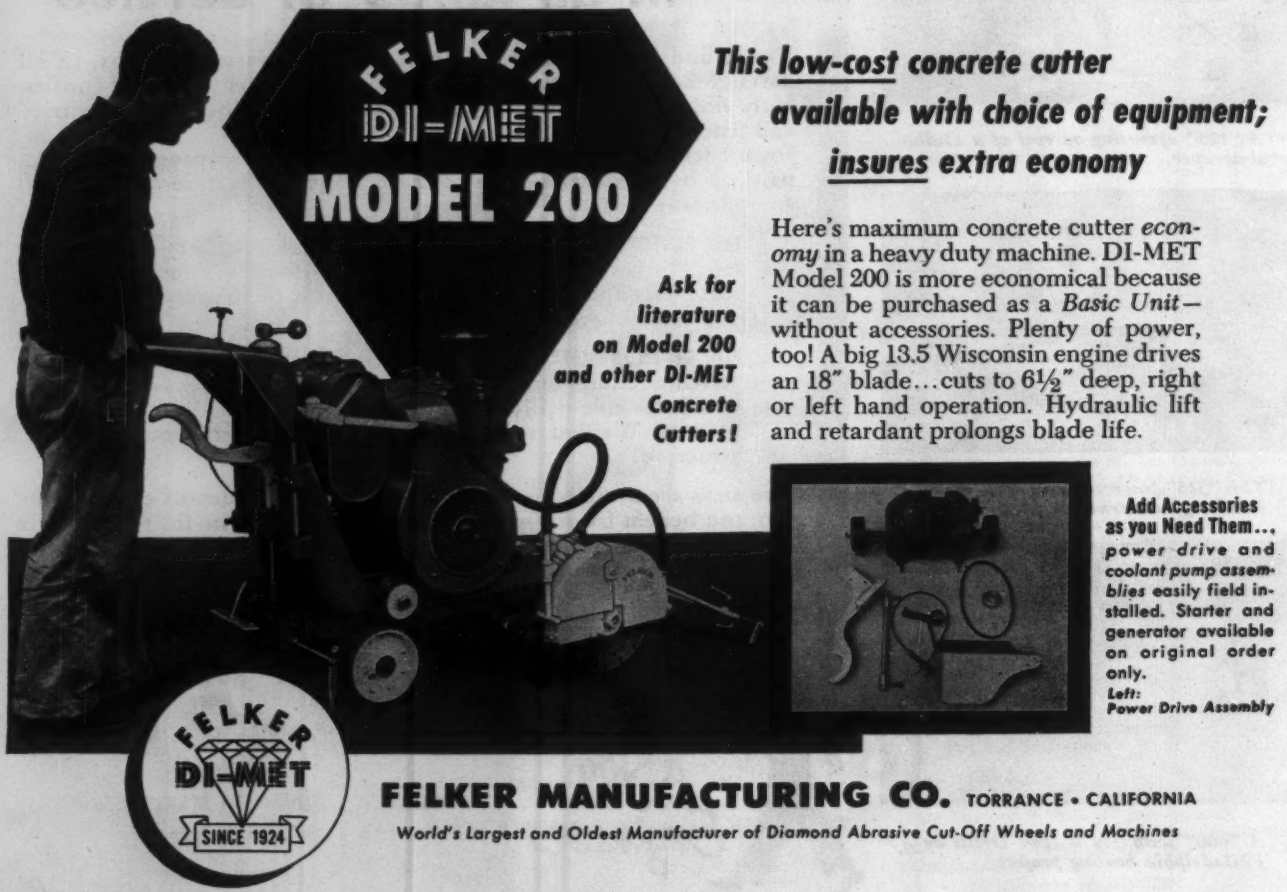
Heath Constr. Ltd., 93 Algoma St., Port Arthur, Ont., CA, $455,207, 80-bed HOSPITAL, PORTAGE LA PRAIRIE, MAN. Portage General Hospital Bd. Dist. No. 8, Portage La Prairie, Man. Bids Apr. 27. CD 4/12.

Cecil Carpenter & Co. Ltd., 5139 Decarie Blvd., Montreal, Que., CA $110,000. NEWSPAPER PLANT addn. MONTREAL, QUE. Le Petit Journal, 5460 Royalmount Ave. E., Montreal, Que. Paul Lemieux, 1846 Dorchester St. W., Montreal, Que., archt. Awarded May 10. CD 6/16/49.

Louis Donolo Inc., 8320 St. Lawrence Blvd., Montreal, Que., CA $150,000, FACTORY addn. MONTREAL, QUE. Smith, Kline & French Inter-American Corp., 300 Laurentian Blvd., Montreal, Que. Bids May 2, awarded May 12. CD 4/11.

▲ Lakeshore Homes, Ltd., 5165 Sherbrooke St. W., Montreal, Que., Owner Builds, $1,500,000. 112 HOUSES in housing project, in Pointe Claire suburban area, MONTREAL, QUE. Geo. Shubin, 4326 Sherbrooke St. W., Montreal, Que., archt. R. T. Affleck, 4350 Sherbrooke St. W., Montreal, Que., arsht.

(Continued on page 125)



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Here's maximum concrete cutter *economy* in a heavy duty machine. DI-MET Model 200 is more economical because it can be purchased as a *Basic Unit*—without accessories. Plenty of power, too! A big 13.5 Wisconsin engine drives an 18" blade...cuts to 6½" deep, right or left hand operation. Hydraulic lift and retardant prolongs blade life.

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Left: *Power Drive Assembly*

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Manitowoc...

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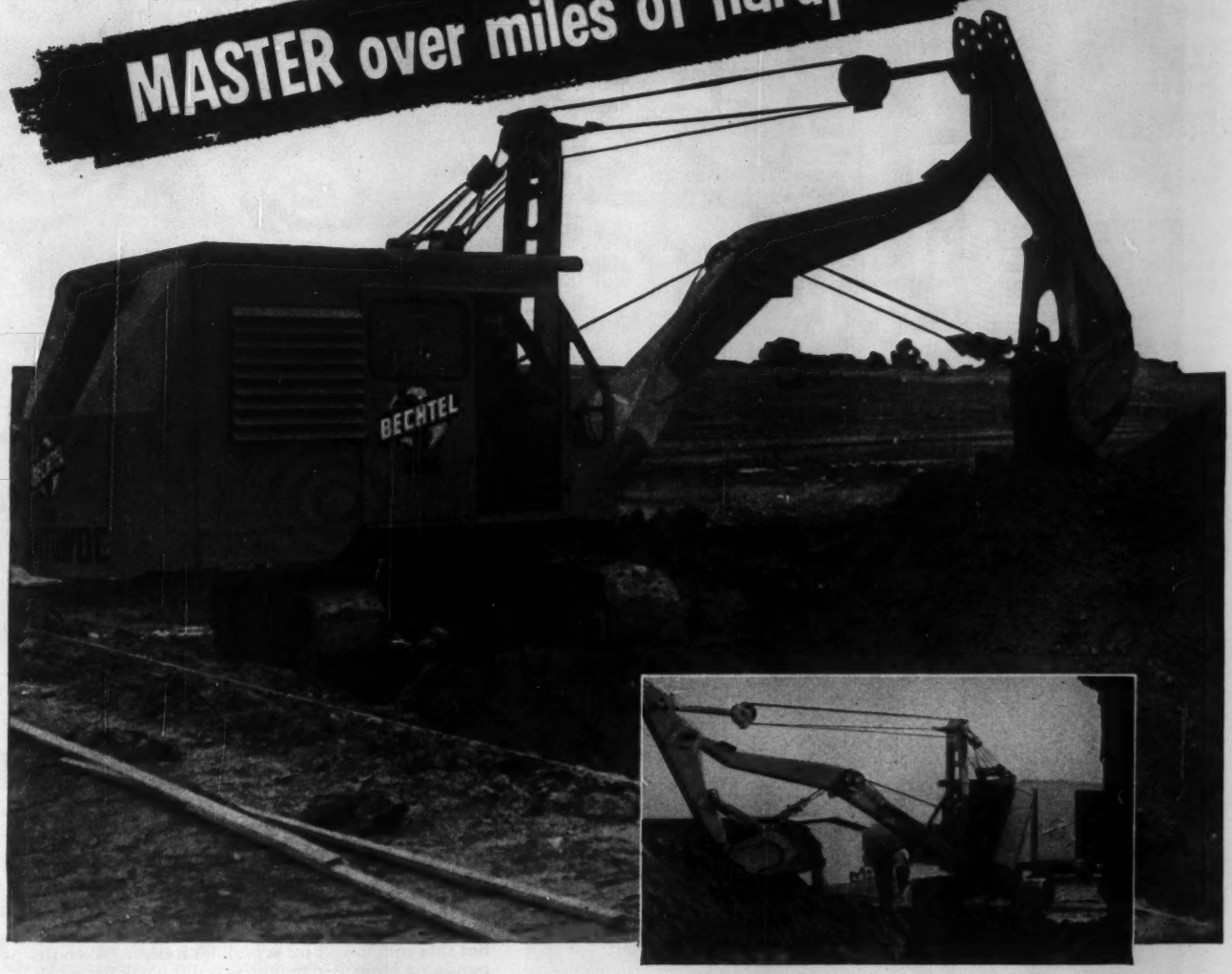


2 Manitowoc One-Yard Hoes lick tough hardpan on refinery job for BECHTEL CORP. at Anacortes, Washington

When the going got rough and other units scratched, picked and hacked to the tune of lost time and low production — it was time to bring in the Manitowocs!

The two "1600" hoes waded in and the hardpan took a pasting. Mile after mile, these "work horses" dug in — 25 ft. deep at times — and came up with full dippers of pay dirt every time.

The trench had to be 9 ft. wide in many spots and Manitowoc's boom strength and stability enabled it to trim trench edges clean and neat without traveling. This superior feature — plus Manitowoc's 37′ reach resulted in no lost motion and more miles of trench per shift.

Need a big-producing hoe? Get the facts on the Manitowoc 1600. Manitowoc Engineering Corp., Manitowoc, Wis.

MANITOWOC

SHOVELS .1-5 YD. Speed Crane CRANES 20-100 TON

HOMELITE TO THE RESCUE

Rained last night . . . rained the night before . . . but this job stayed on schedule. Reason? Two dependable Homelite pumps saved the day for work. Only one man needed to carry these gasoline engine driven units to the best pumping location. A quick start and dependable pumping action makes short work of rain or seepage problems.

You can do something about the weather and do it fast when you have a Homelite carryable pump. No waiting for bulky equipment . . . no loss of job time and money due to work stoppages. Ask your Homelite Representative for a free demonstration or write us for the details.

HOMELITE CORPORATION

1105 Riverdale Avenue, Port Chester, N. Y.

(Continued from page 122)

ALASKA

BIDS ASKED—BUILDINGS

Alaska, Kaka—SCHOOL—BA 6/8—Alaska P. Wks., Dpt. Interior, 123 W. 3 St., Juneau, 1 story frame school. Proj. 50-A-197. Plans deposit $25.

HEAVY CONSTRUCTION

LOW BIDS AND CONTRACTS

▲† Raber & Kief, 420 Queen Anne Ave., Seattle, Wash., CA $1,168,975, replacements, imprvs. to existing water supply and distr. sys., fire alarm sys. and painting of three 300-ft. antenna towers at U. S. Naval Station, NOY 87924, ADAK, ALASKA. Officer in Charge of Constr., Bureau Yards & Docks, Box 38, c/o Postmaster, Seattle, Wash. Bids Apr. 1. CD 5/4, under LB.

LATIN AMERICA

BUILDINGS

LOW BIDS AND CONTRACTS

▲ Arthur G. McKee & Co., 2300 Chester St., Cleveland, O. CA Est. $15,700,000. BLAST FURNACE for steel plant in Buenos Aires area, PUNTA ARGERICH, ARGENTINA. Govt. of Argentina, Buenos Aires, Argentina.

▲ Thompson-Starrett Co., Inc., 130 N. Wells St., Chicago, Ill., U. S. A. and Lewis Constr. Co., Lowman Bldg., Seattle, Wash., U. S. A. CA Est. $50,000,000. 4,000 HOUSES, streets, landscaping, civic center, water mains, sewerage disposal sys. and other facilities, BOGOTA, COLOMBIA. Instituto de Credito Territorial, Bogota, Colombia.

AMERICANS ABROAD

BIDS ASKED—BUILDINGS

▲ Bids will be taken on the following project under International competitive bidding of NATO.

FRANCE

NATO Headquarters Office, Palais de Chaillot, Paris, construction of NATO headquarters bldg. in Paris. Est. $5,714,284. Firms wanting to bid should report their interest before July 1. For information on bidding NATO projects see 6/25 Construction Daily.

BUILDINGS

LOW BIDS AND CONTRACTS

▲ The Lummus Co., 385 Madison Ave., New York, N. Y. CA $17,000,000. design and construct. oil refinery to process 750,000 tons crude oil yearly, TURKU, FINLAND. Govt. of Finland, Helsinki, Finland.

Proposed Projects

WATER SUPPLY

▲ Md., Baltimore—City, Bureau Water Supply, 503 Municipal Bldg., Zone 2, water connection with Susquehanna River, 37 mi. pipe line to river as addnl. water supply, two 3 mi. tunnels, 31 mi. open cut pipe line 108 in. diam., $30,000,000. Whitman, Requardt & Assoc., 1304 St. Paul St., Baltimore 2, Md., engrs. CD 11/9.

▲ O., Lima—City, 3 billion gal. reservoir. $1,500,000.

SEWERS, WASTE DISPOSAL

▲ Ill., Calumet City—City, City Hall, sewers and paving, $1,000,000. Consoer, Townsend & Assocs., 351 E. Ohio St., Chicago, Zone 11, consult. engrs.

Mass., Northampton—City, sewage disposal plant, $800,000, Weston & Morganroth, 294 Washington St., Boston, consult. engrs. CD 9/26/49.

Minn., Minneapolis—City, Mrs. A, Finkle, clk., storm drains. $900,000, H. Erickson, city engr. W. Ostrem, asst. engr. in charge of sewers. CD 3/28/45.

▲ Tex., San Angelo—City, sewage disposal plant. $1,110,000. Freese & Nichols, 407 Danciger Bldg., Fort Worth, consult. engrs.

Utah, North Salt Lake—North Salt Lake Town Bd., 7650 Howard Rd., sewerage sys. $600,000. Thomas C. Adams, 19 W. S. Temple St., Salt Lake City, consult. engr.

▲ Man., Winnipeg—City, City Hall, N. S. Bubbic, genl. mgr., incinerator plant addn. or new plant, $1,000,000. W. D. Hunt, city engr.

BRIDGES

Ala., Birmingham—City, Dpt. P. Imprvts., City Hall, steel, concrete railroad underpass on 13 Sts. S., $550,000. J. W. Goodwin Engineers, Inc., 2111 7 Ave. S., consult engr. CD 10/9/53.

STREETS AND ROADS

▲ Mich., Detroit—City, Glenn C. Richards, comr. Dpt. P. Wks., City-County Bldg., Zone 26, wid'n., paving Wayne St. between Michigan Ave. and Lafayette St. $1,000,000. M. F. Wagnitz, 528 City-County Bldg., city engr. CD 3/30/43.

Tex., Nederland—City, street imprvs. and paving, $500,000. Charles R. Haile & Assocs., Inc., 2801 San Jacinto St., Houston, consult. engr.

Coolite keeps brighter rooms Cooler

THREE TYPES OF MISSISSIPPI GLASS SOLVE THREE SEPARATE PROBLEMS IN MODERN FLORIDA HIGH SCHOOL

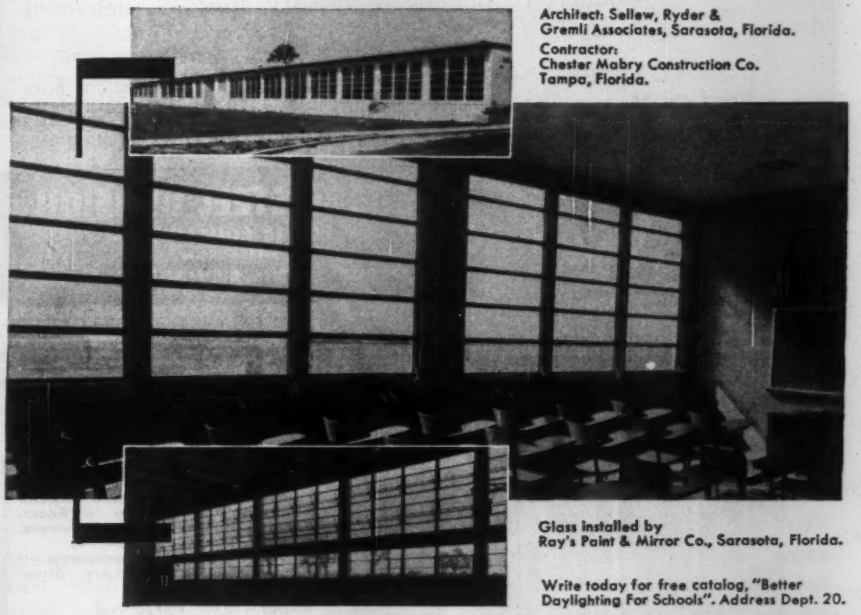
Although solar heat can make interiors extremely uncomfortable, Coolite helps keep this Booker High School, Sarasota, Florida, both brighter and cooler. In this modern structure, three types of this amazing Mississippi, blue-green, translucent glass have been used.

Coolite, Heat Absorbing Glass, floods classrooms with softly tinted daylight for easier seeing without undue solar warmth to distract pupils. The brighter rooms seems larger, friendlier. Students see better, feel better, work better, under Coolite.

In those areas of the school where glare as well as heat presents a problem, Coolite Heat Absorbing and Glare Reducing Glass is used for greater daylight control and comfort.

Coolite, Heat Absorbing Wire Glass (Fire Retardant No. 32) is used in the gymnasium . . . provides maximum illumination . . . retards sun heat . . . helps bottle up fire. Polished Wire Glass is also used throughout the building in vulnerable locations for fire and breakage protection.

Consider Coolite for your new school. Give your classrooms greater comfort and "eye-easy" daylighting. Specify glass by Mississippi. Available in a wide variety of patterns and surface finishes for every need . . . every budget.



Architect: Sellew, Ryder & Gremli Associates, Sarasota, Florida.
Contractor: Chester Mabry Construction Co. Tampa, Florida.

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Write today for free catalog, "Better Daylighting For Schools". Address Dept. 20.

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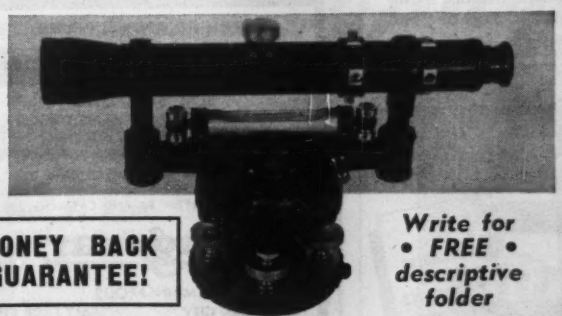

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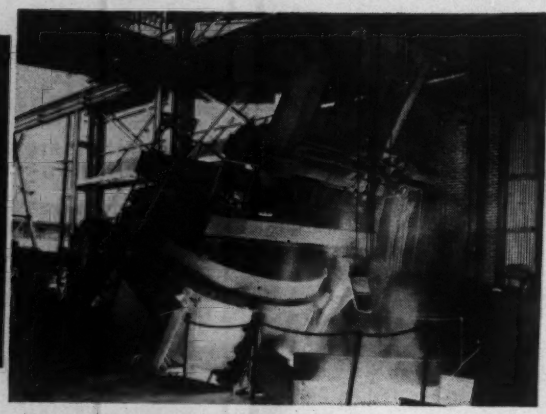

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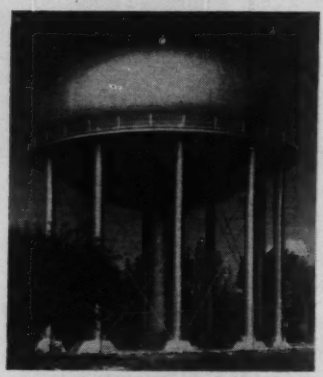

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E. J. Longyear CO.
MINNEAPOLIS
NEW YORK CITY SALT LAKE CITY

Tex., Port Arthur—City, voted bonds Apr. 5, street imprvs., paving, $700,000. Freese, Nichols & Turner, 2111 C & I Life Bldg., Houston, consult. engrs.

EARTHWORK, WATERWAYS

▲ Ia., Dubuque—City, City Hall, voted $2,000,000 bonds waterfront development at Mississippi River.

Massachusetts—Commonwealth of Mass., Dpt. P. Wks., 100 Nashua St., Boston, dredging Mystic River 30, 35 ft. channel from Boston Harbor to Medford-Somerville, $500,000, CD 6/20/52, reconstr. raising seawall, placing revetment and sand fill, Winthrop, $210,000.

Michigan—State, Waterways Comn., 1302 Cadillac Bldg., Detroit, breakwater, Saginaw Bay protection, Port Austin. $970,000.

▲ Vermont—Central Vermont Public Service Corp., 121 West St., Rutland, hydro electric proj., Lamoille River to incl. dam and power house, East Georgia. $2,000,000. Charles T. Main, Inc., 80 Federal St., Boston, Mass., engr.

AIRPORTS

† Calif., March Air Force Base—DORMITORIES—U.S. Eng., 715 S. Figueroa St., Los Angeles, plans by William Allen, 6112 Wilshire Blvd., Los Angeles, two 3 story 200-man concrete block dormitories, $550,000. CD 12/10/52.

† Calif., San Bernardino—DORMITORIES, etc.—U. S. Eng., 751 S. Figueroa St., Los Angeles, Plans by Kistner, Wright & Wright, 817 W. 5 St., Los Angeles, two 3 story, 200-man airmen's dormitories, Norton Air Force Base, $550,000.

PUBLIC BUILDINGS

Calif., Modesto—SCIENCE—Modesto Junior College, Franklin School, Modesto, plans by John Bomberger, 1505 10 St., Junior College Science Bldg. for Modesto Junior College, $550,000. CD 12/3.

▲ Calif., Redding—SCHOOL—Shasta Lake Union Elementary School District, Redding, plans by Clayton Kantz, Box 1718, Senior High School $1,000,000. CD 10/12/53.

▲ Conn., Hartford—SCHOOL—City, 550 Main St., Plans by Keith Sellers Heine, 71 Oxford St., Hartford, 2 story, brick, steel, concrete elementary school, Newington and New Britain Aves. $1,600,000. Paul D. Bemis, 36 Pearl St., mech. engr. Robert W. Loomis, 32 Maple St., Windsor, structural engr. CD 2/23.

Ill., Cahokia (East St. Louis P.O.)—SCHOOLS—Cahokia Commonfields Unit Dist. 187, Bd. Educ., Aaron Brien, supt. Schools, Cahokia Commonfield High School, Range and Jerome Lanes, R.R. No. 2, East St. Louis. Plans by Charles E. King, 19A N. Illinois Ave., Belleville, elementary school Centerville area and 2 existing schools addns. $700,000. CD 4/19.

▲ Ky., Frankfort—SCHOOL—Franklin Co. Bd. Educ., Chas. W. Hart, county supt., 315 Ann St., plans by Gray & Coblin, 314 S. Ashland Ave., Lexington, consolidated county high school in East Frankfort, $1,000,000.

▲ Md., Baltimore—HEALTH—City, Bureau Bldg. Constr., 410 Municipal Bldg., Zone 2, authorization for a bond issue of $1,000,000 approved by voters at May 3rd election, for constr. of western district health bldg. will have to be passed by legislature at next session. CD 12/13.

▲ Md., Baltimore—INFIRMARY—City, Bureau Bldg. Constr., 410 Municipal Bldg., Zone 2, authorization for a loan of $1,500,000 approved by voters May 3rd election for erecting east wing and rear west wing of infirmary at city hospital, will have to be passed by legislature at next session.

▲ Md., Baltimore—SCHOOLS—City, Bureau Bldg. Constr., 410 Municipal Bldg., Zone 2, authorization for a loan of not more than $15,000,000 approved by voters at May 3rd election for school constr. and planning, will have to be passed by legislature at next session. CD 11/9.

▲ Minn., Minneapolis—HIGH SCHOOL, Bd. Educ., R. Putnam, supt. Schools, 807 N. E. Broadway, Junior High School in southwest part of city to serve Kenney and Armatage Grade districts. $1,000,000.

Mo., Carrollton—HOSPITAL—Carroll Co., $950,000 bond election June 7, hospital, Terney & Brey, 216 E. 10 St., Kansas City, Mo., archts.

▲ Mo., Columbia—FINE ARTS—Curators of University of Missouri, Leslie Cowan, vice pres., 111 Jesse Hall, fine arts bldg. for university, $1,800,000. CD 2/9/53.

▲ Mont., Great Falls—SCHOOL—Great Falls School Dist. 1, voted $3,957,000 bonds, high school. CD 1/14.

Nev., Carson City—OFFICE—State, State Bldg., Carson City, state office, $750,000. CD 2/23/45.

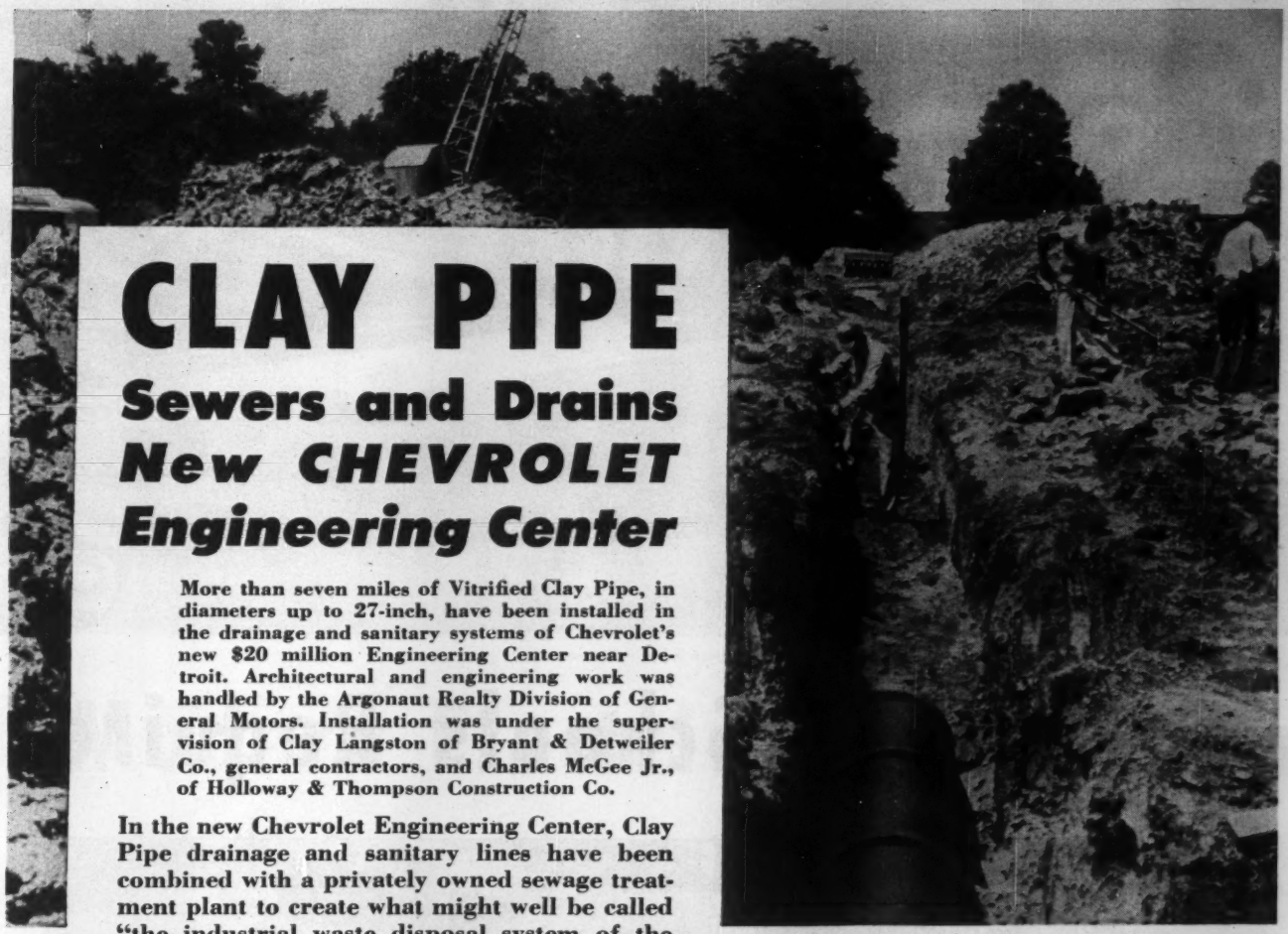
N. J. Hopewell—SCHOOLS—Bd. Educ., Hopewell, plans by Hankin, Stull & Backes, 212 W. State St., Trenton, high school, $500,000; elementary school bldg. program, $350,000. Grady & Meyer, 219 W. State St., Trenton, consult. archts. CD 1/19/51.

N. J., Pennsauken—SCHOOL—Pennsauken Twp. Bd. Educ., Junior-Senior High School. $750,000.

▲ N. Y., Sayville—SCHOOL—Sayville School Dist., Green Ave., vote on proj. June 4, Senior High School, $3,000,000; elementary school, $900,000 both on Cherry Ave.

▲ N. Y., South Huntington—SCHOOL—Union School Dist. 13, High School, vote on proj. May 19, Junior High School, on 20 acre tract, $2,400,000.

(Continued on page 130)



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Sewers and Drains

New CHEVROLET Engineering Center

More than seven miles of Vitrified Clay Pipe, in diameters up to 27-inch, have been installed in the drainage and sanitary systems of Chevrolet's new $20 million Engineering Center near Detroit. Architectural and engineering work was handled by the Argonaut Realty Division of General Motors. Installation was under the supervision of Clay Langston of Bryant & Detweiler Co., general contractors, and Charles McGee Jr., of Holloway & Thompson Construction Co.

In the new Chevrolet Engineering Center, Clay Pipe drainage and sanitary lines have been combined with a privately owned sewage treatment plant to create what might well be called "the industrial waste disposal system of the future." Clay Pipe is the company's assurance of trouble-free service, and the privately owned treatment plant is the community's insurance that industry will continue to be a good neighbor.

For industrial or other construction, where permanency is the watchword, drainage and sanitary lines *must* be down for "keeps." That's why Vitrified Clay Pipe is the universal preference of engineers and contractors. They depend on it because it *never wears out.*

For *permanent* drainage lines and storm sewers —to protect *permanent* construction—always specify Vitrified Clay Pipe. *It's guaranteed for half a century!*

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CLAY PIPE FITTINGS SIMPLIFY INSTALLATION

You never have a "patchwork" of materials when you install Vitrified Clay Pipe. This Hub, for example, permits connection of two spigot ends. It's only one of dozens of readily available fittings made of the same never-wear-out Vitrified Clay as the pipe itself.

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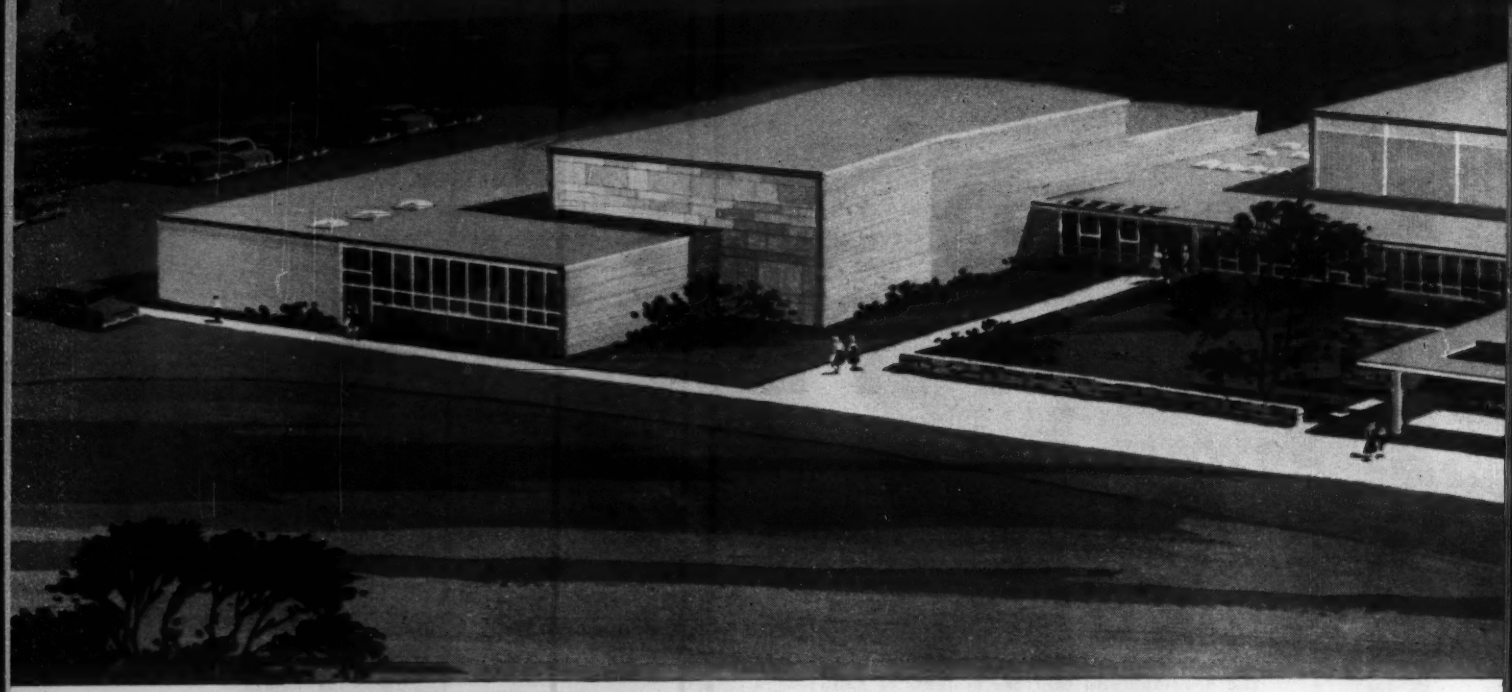
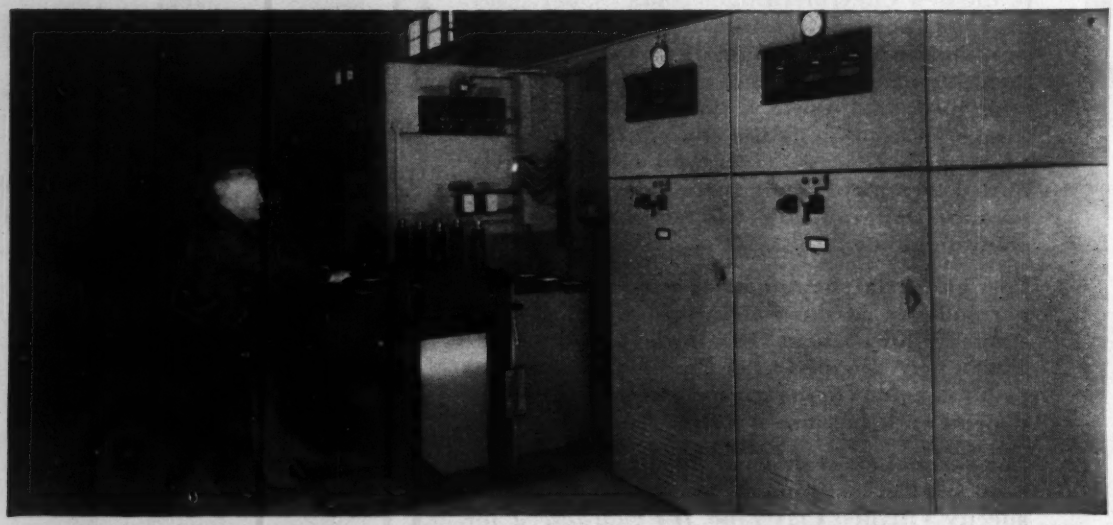
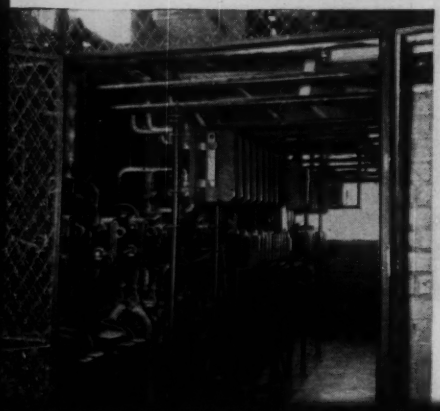


Modern Schools Require

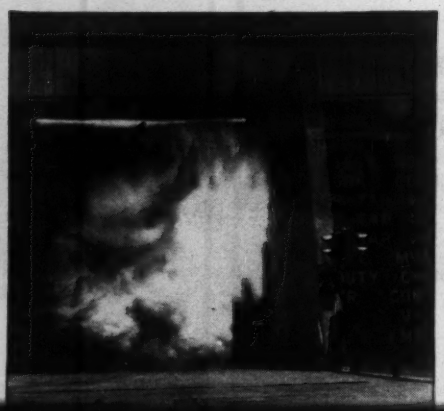


G-E METAL-CLAD SWITCHGEAR with magne-blast air circuit breakers provides maximum electrical protection.

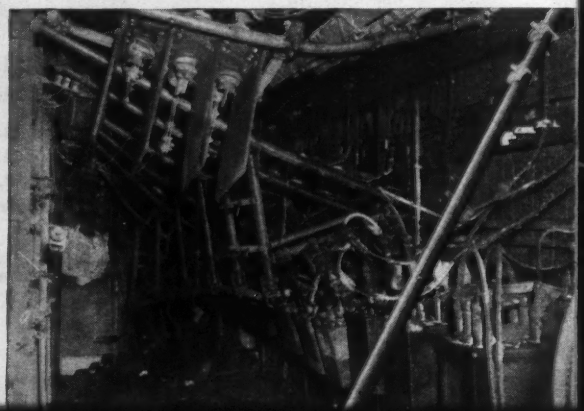
TYPICAL INSTALLATION of inadequate open-type switchboard that may invite electrical failure.

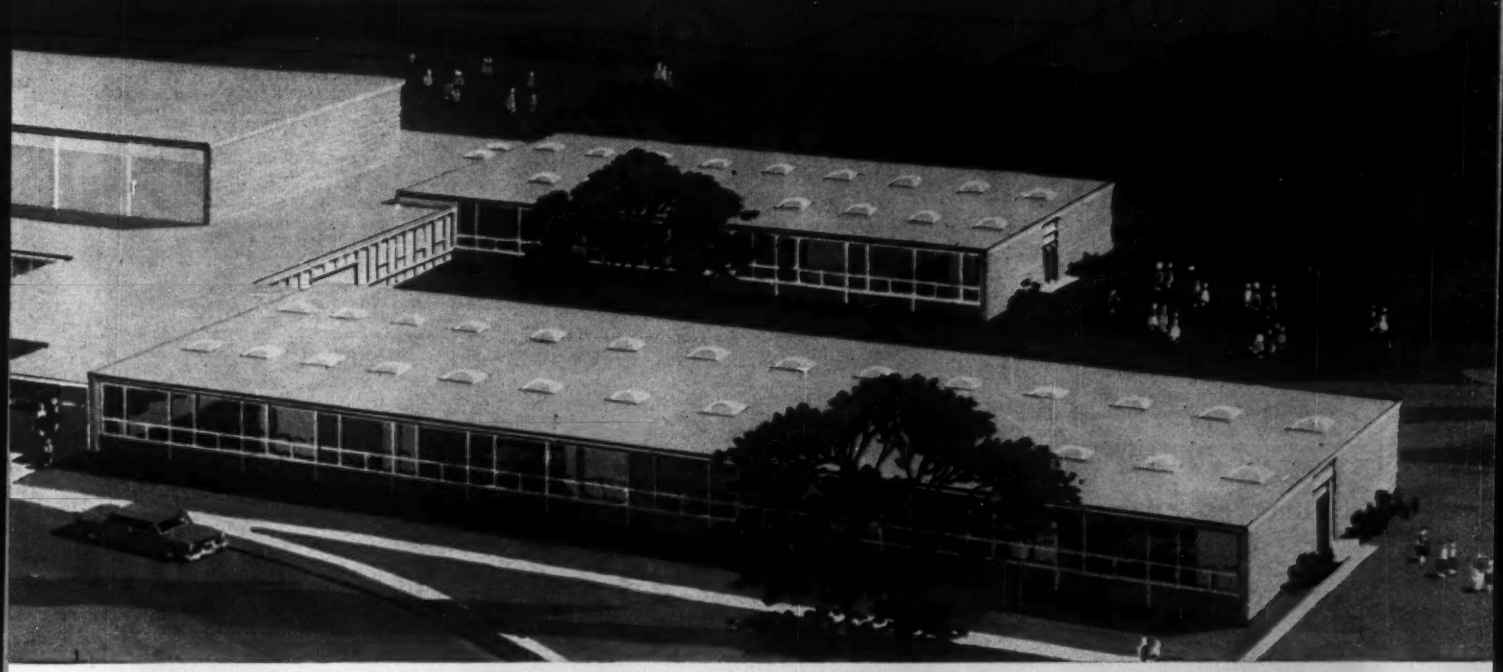


OVERLOADED CIRCUIT BREAKER actually exploded when tested beyond its limits at G.E.'s Switchgear Testing Laboratory.



RESULTS OF VIOLENT EXPLOSION caused when an installation of outmoded primary switchgear failed to interrupt short circuit.





Proposed high school designed by Sargent, Webster, Crenshaw & Folley, Architects, A.I.A., Syracuse, N. Y.

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The increased use of electricity in today's modern schools now makes it possible for many schools to take advantage of the economies of purchasing high voltage power. When this is done, reliable service entrance switchgear is required to assure maximum protection of the school electrical system.

Outmoded open-type switchboards and dangerously inadequate switch and fuse combinations may actually explode or start an oil fire when asked to interrupt a short circuit beyond their interrupting capacity. This fact has been underlined by tests held at General Electric's Switchgear Testing Laboratory as well as by actual "in service" explosions.

So, play safe, be sure of the interrupting capacity of your school's switchgear. And when you order switchgear, here's how to make sure that you obtain equipment that will provide highly dependable performance and assure maximum protection for your school's electrical system.

SPECIFY THESE FEATURES

- Completely metal-enclosed Switchgear in accordance with AIEE and NEMA standards.
- Magnetic air circuit breakers, electrically operated, of adequate rating
- Flame retardant insulation

Because when you specify General Electric Metal-clad Switchgear with magne-blast air circuit breakers you provide for maximum safety.

- Reduced fire hazards to life and property
- Reduced electrical hazards to personnel
- Reduced service interruptions for maintenance
- Reduced hazards to electric service continuity

For information about how General Electric Metal-clad Switchgear can help protect your electrical system, see your nearest G-E apparatus sales representative or write for bulletins GEA-5664 and GEA-6294. General Electric Co., Schenectady N.Y.

511-14

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EASY, PROVEN WAY to PERMANENTLY BOND CONCRETE TO CONCRETE

WELD-CRETE®

Weld-Crete is the amazing liquid bonding agent which enables you to *permanently* bond new concrete *directly* to old concrete . . . or to most any other structurally sound surface . . . *without need for costly, time-consuming chipping, drilling, roughening, acid washing or scarifying of concrete base.*

Weld-Crete has equal bonding permanence all climates, all surfaces, all sorts of conditions. When used with quick setting cement topping you can lay new floors, ramps, driveways, etc. one day and run heavy truck traffic over them the next. Get facts from your building materials supply dealer or write Larsen Products Corp., Box 5756-I, Bethesda, Md.

TYPICAL **WELD-CRETE** APPLICATION

National Brick Co., Terra Cotta, D.C.

Here Weld-Crete was used to bond new ¾" concrete topping directly to old, badly chipped and spalled floor slab which had been subjected to ceaseless heavy truck traffic. Plant shut-down time eliminated as Weld-Crete enabled National's own mechanics to do job over week end.

In a Hayward there's no contact between the closing mechanism and the gravel or other material handled. To be sure—this "no contact" feature is only one advantage. But a very important one to you—since it means much less wear, reduced upkeep, and a significant dollar-saving in bucket maintenance.

Note also, Hayward's extreme simplicity, the smaller number of parts—and all easily accessible—the larger closing sheaves particularly shaped to minimize rope wear, the extra large load capacity.

Write for folder today! THE HAYWARD COMPANY, 50 Church Street, New York 7, N. Y.

HAYWARD BUCKETS

CLAM SHELL • ELECTRIC • ORANGE PEEL • GRAPPLES

famous for performance since 1888

(Continued from page 126)

N. Y., Syosset—SCHOOL—Central School Dist. No. 2, plans by Eggers & Higgins, 100 E. 42 St., New York, Zone 17, high school. $500,000. CD 10/20.

▲ O., Bellefontaine—SCHOOLS—Bd. Educ., Bellefontaine, voted $1,250,000 bonds May 3, three elementary schools.

▲ O., Columbus—6SCHOOLS—Bd. Educ., Franklin Twp. School Dist., Columbus, voted $1,250,000 bonds May 3, complete new high school, addnl. elementary classrooms and obtain site for elementary school bldg. CD 2/25.

▲ O., Dayton—HOUSING—Dayton Metropolitan Housing Auth. Harries Bldg., plans by Emory J. Ohler, Hulman Bldg., W. Ray Yount, Third Natl. Bldg., Rial T. Parrish, Knott Bldg., and William G. Ward, 496 Shiloh Dr., 300 West Side low-income homes, McCall St., east of Gettysburg Ave. and south of W. Third St. $3,500,000. CD 5/5/53.

▲ O., Dayton—SCHOOLS—Bd. Educ., 232 N. Main St., voted bonds May 3, school expansion program. $20,000,000. CD 1/11.

▲ O., Findlay—SCHOOLS—Bd. Educ., Findlay, voted $2,000,000 bonds May 3, building new schools and remodeling present ones. CD 4/26.

Pa., Greenwood—SCHOOL—Aston-Brookhaven Joint School Bd., Greenwood, high school, $750,000.

Pa., Stroudsburg—HIGH SCHOOL—Delaware Water Gap-Stroudsburg Joint Bd., Stroudsburg, plans by Rinker & Keifer, Stroudsburg, Stroudsburg-Monroe High School addn. $750,000.

Tex., Big Spring—COLLEGE BLDG.—Big Spring Junior College, Big Spring, plans by Puckett & French, Big Spring, college bldg. $600,000. CD 5/9.

▲ Tex., San Antonio—SCHOOLS—Northeast Independent School Dist., c/o C. L. Camp, Lockwood-Selma Rd. voted bonds Apr. 30, Senior High School, $1,000,000; Junior High School, $910,000; Elementary School No. 1, (Allena Village). $375,000; Elementary School No. 2, (Dellview Addn.) $365,000; Elementary School No. 3, (Dellview Addn.) $350,000; Elementary School No. 4, (Castle Hill Subdivision), $370,000; Elementary School No. 5, (Hollywood Estates) $380,000. CD 4/18.

▲ Va., Marion—SCHOOLS—Smyth Co. School Bd., J. L. Mauck, supt., Court House, Marion, plans by J. L. Williams & Assoc., Gwyn Bldg., Rich Valley High School, Rich Valley, $500,000; Chilhowie High School, Chilhowie, $500,000.

Wyo., Lander—SCHOOL AUDITORIUM, etc.—Fremont Co., Vocational High School Dist., Lander, plans by Tressler & McCall, Box 900, Cody, high school auditorium and shop, $850,000.

▲ Ont., Oakville—SCHOOL—Oakville & Trafalgar High School Bd., 135 Church St., high school, near here. $1,100,000. CD 11/8/51.

Ont. Toronto—COMMUNITY CENTER—York Township Arena Com., B. Robinson, chn., 395 Caledonia Rd., community center. $800,000.

COMMERCIAL BUILDINGS

▲ Ala., Birmingham—BANK—Federal Reserve Bank, 104 Marietta St. N.W., Atlanta, Ga., plans by Toombs, Amisano & Wells, 127 Walton St. N.W., Atlanta, Ga., and Shaw & Renneker, 2021 6 Ave. N., 5 stories above ground, 2 stories below, banking house addn. $2,500,000.

▲ Calif., Milpitas — HOME — Mobilehomes Corp. & Jaupet Inc., Hy. 99 at Notch Rd., Modesto, 268-home subdivision, 1½ mi. north of Milpitas on Hy. 17, $1,900,000.

▲ Calif., Sacramento—HOME—Jackmarc, Inc., c/o Williams, Bowker & Ward, Inc., 1804 J St., 171 home subdivision, $1,900,000.

Calif., San Diego—DWELLINGS—Mission Development Corp., c/o H. Douglas Byles, archt., 622 S. Lake Ave., Pasadena, 63 frame, stucco dwellings, $600,000.

Calif., San Francisco—HOSPITAL—St. Francis Hospital, c/o Administrator, Bush and Hyde Sts., plans by F. W. Trobucco, 355 Stockton St., modernization of St. Francis Hospital, $550,000. W. H. Ellison, 1045 Sansome St. consult. engr. CD 2/2.

▲ Calif., San Rafael—SHOPPING CENTER—Montecito Properties, Inc., c/o E. Goodman, Sylvan Lane, Ross, shopping center near San Rafael Municipal Yacht Harbor. $3,000,000.

Calif., Santa Venetia—HOME—Sidney Schwartz, 1210 Irwin St., San Rafael, 26 home subdivision, $700,000.

Ga., Atlanta — HEADQUARTERS — American Red Cross, 230 Spring St. N.W., headquarters, 1955 Monroe Dr. N.E. $600,000-$800,000.

▲ Ga., Atlanta—CLINIC—Emory University, City Office, Candler Bldg., Emory Clinic. $1,000,000.

Ill., Mishawaka—BANK—First National Bank Mishawaka, plans by Paul F. Jernegan, 223 Lincolnway, bank addn. $500,000.

▲ Mass., Boston—OFFICE—Julius E. Rosengard, 44 Kilby St., plans by Arthur Rosenstein, 184 Boylston St., Boston, 14 story office, Kilby St., $1,000,000.

▲ Nev., Las Vegas—SHOPPING CENTER—Twin Lake Shopping Center, 1620 Fremont Ave., plans by Zick & Sharp, 1806 S. Main St., masonry shopping center, 5-acre parking area. $3,000,000.

▲ N. J., Newark—RESEARCH CENTER—St. Michael's Hospital, 306 High St., plans by William Neumann & Sons, 587 Summit Ave., Jersey City, N. J., 7 story research center, Burnet St. $1,000,000.

N. Y., Brooklyn—APARTMENT—Nostrand Building Corp., 3036 Avenue U, Zone 29, plans by Julius Fishkind, 161-19 Jamaica Ave., Jamaica, 6 story apartment, 3165-3199 Nostrand Ave. $780,000.

▲ N. Y., Elmhurst—APARTMENT—Town Leasing Corp., c/o George Miller, archt., 125 W. 45 St., New York, Zone 19, 6 story apartment, at west side of 80 St. north of 45 Ave. $1,250,000.

▲ N. Y., Forest Hills—APARTMENT—Barclay Plaza Apartments, c/o Philip Birnbaum, archt., 12 E. 48 St., New York, Zone 17, 8 story apartment, 71 Road and 110 St. $1,257,750.

▲ N. Y., Hillcrest—SHOPPING CENTER—Webb & Knapp, Inc., 270 Park Ave., New York, Zone 17, 2 story shopping center on north side of Union Turnpike, east of Parsons Blvd. $1,850,000.

N. Y., Long Island City—APARTMENT—Kroy Building Corp., c/o Greenberg & Ames, 303 Fourth Ave., New York, Zone 10, 6 story apartment; Crescent St. and 31 Ave. $500,000.

N. Y., New York—OFFICE—Owner, c/o Schaffer Management Corp., 1440 Broadway, Zone 26, plans by Alexander Zamshnick, 44 W. 56 St., Zone 19, 10 story office addn. to existing bldg., 19 Rector St. $750,000.

▲ N. Y., New York—OFFICE—Seaman's Bank for Savings, 74 Wall St., Zone 5, plans by Voorhees, Walker, Smith & Smith, 101 Park Ave., New York, Zone 17, 10 story office, 165 Pearl St. $1,000,000.

▲ N. Y., New York—APARTMENT—200 E. 57 St. Corp., 1 E. 57 St., Zone 22, plans by H. I. Feldman, 415 Lexington Ave., Zone 17, 18 story apartment, 200-208 E. 57 St. $1,518,000.

▲ N. Y., New York—APARTMENT—Smitoni, Inc., 69 E. 59 St., Zone 22, plans by H. I. Feldman, 415 Lexington Ave., Zone 17, 12 story apartment, 309-19 E. 70 St. $1,400,000.

▲ O., Cleveland—HOTEL-OFFICE—Henry Soloman, 1835 Euclid Ave., 20 story hotel-office, on 50,000 sq. ft. tracts, Euclid Ave. and East 18 St. running back to Prospect Ave. $12,000,000.

▲ O., Granville—BUILDING—Acre of Mercy Foundation, Granville, plans by Orville Verasso of Merle T. Orr & Assocs., Newark, 2 story, rein.-con., block building with two wings, to house administrative office chapel and 150 mentally retared children. $1,000,000.

▲ Pa., Elkins Park — SHOPPING CENTER — Orleans Constr. Co. & Tyson Constr. Co., 100 W. Rockland St., Phila., plans by Welton Becket & Assocs., 5657 Wilshire Blvd. Los Angeles, Calif., shopping center, Washington Lane and Cheltenham Ave. $1,000,000.

▲ Tex., Abilene—COLLEGE—Abilene Christian College, Abilene, college bldgs. $1,000,000.

Tex., Abilene—SHOPPING CENTER—Rooks Corp., Abilene, plans by Irving R. Klein & Assocs., 1317 Austin St., Houston, shopping center. $800,000.

▲ Tex., Corpus Christi—SHOPPING CENTER—Parkdale Plaza Shopping Center, R. R. Rowe, mgr., S. Staples and Gollihar Sts., plans by Irving R. Klein & Assocs., 1317 Austin St., Houston, Unit 2, shopping center, $750,000; Unit 3, shopping center, $875,000.

▲ Tex., Dallas—DWELLINGS—Vernon & James Smith, 2151 Fort Worth Ave., 50 frame apartments, $650,000; 25 brick apartments, $355,000; 40 brick and frame apartments, $450,000; 60 one-bedroom apartments, $425,000; off Corinth St.; 4 masonry dwellings, $450,000; 5 masonry dwellings, $500,000; 6 all-masonry dwellings, $600,000 3 masonry dwellings, $350,000, in Kessler Lake Estates; 30 frame and cedar shake dwellings, $379,500; 35 frame dwellings, $376,500; 32 frame dwellings, $350,000; 20 all masonry dwellings, $355,000; 28 frame, masonry dwellings, $367,500; 25 brick dwellings, $365,150, in Lochwood Subdivision.

Tex., Fort Worth—HOSPITAL—Fort Worth Children's Hospital, R. Walker, pres., 6 and Cannon Sts., plans by Preston M. Geren, 1607 Fort Worth Natl. Bank Bldg., children's hospital. $500,000.

▲ Wash., Des Moines—RESORT and SHOPPING CENTER—M. Medgard, Des Moines, plans by Johnston & Campanella, Orpheum Bldg., Seattle, Zone 1, resort and shopping center. $1,000,000.

▲ Wis., Milwaukee — SHOPPING CENTER — Hampton Shopping Center Corp., 3805 W. Lisbon Ave., plans by R. E. Rasche, 601 W. Capitol Dr., 1 story, 58,000 sq. ft. shopping center and 340-parking area. $1,500,000.

▲ B. C., Vancouver—BANK—Bank of Nova Scotia, 44 King St. W., Toronto, Ont., plans by Sharp & Thompson, Berwick & Pratt, 1553 Robson St., 8 story bank addn., 602 W. Hastings St. $2,000,000.

▲ Ont., Ottawa—APARTMENT—Glenby Co., 78 Bank St., plans by Greenspoon, Freedlander & Dunne, 4151 Sherbrooke St. W., Montreal, Que., 10 story, 50x100 ft., incl. 100-suite apartment, known as "Glenby Tower," O'Connor and Slater Sts., $1,000,000.

▲ Ont., Thornhill—HOSPITAL—Committee, c/o Dr. H. Gibson Hall, 1050 Avenue Rd., Toronto, Yorkminster Hospital, 14-acre site, John St. and Bayview Ave. $2,000,000.

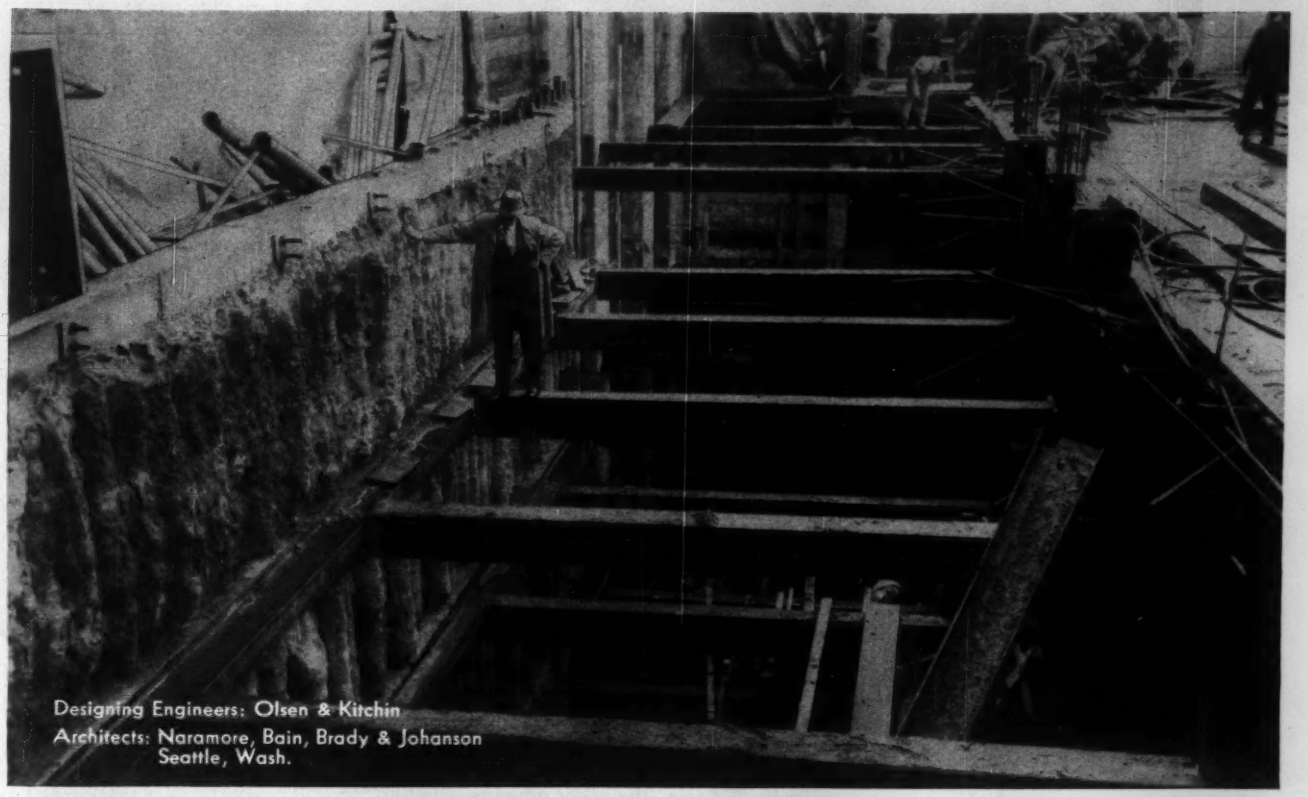
Ont., Toronto—APARTMENT—Armour Heights Apartments Ltd., 2125 Avenue Rd., plans by Molesworth, Secord & Savage, 18 Toronto St., 71-suite apartment, Avenue Road near Ridley Blvd., $500,000.

Ont., Toronto—APARTMENT—Dr. J. Kuhl, 17 Fairleigh Crescent, plans by E. D. Richmond, 455 Spadina Ave., 114-suite, 12 story, concrete, steel, brick apartment, Dowling Ave. south of King St. W. $912,000.

Ont., Toronto—APARTMENT—Meyer N. Wise, 319 Rosemary Rd., plans by J. Brenzel, 658 Spadina Ave., 69-suite apartment, St. George St. $550,000.

▲ Ont., Westminister Twp.—HOMES—Springbank Development Co., 70 York St., London, 100 new homes, $1,200,000. W. M. Veitch, R.R. 4, London, consult. engr.

(Continued on page 133)



Designing Engineers: Olsen & Kitchin
Architects: Naramore, Bain, Brady & Johanson
Seattle, Wash.

Mixed-in-Place Piles, used as shoring, simplified the job of enlarging the Swedish Hospital, Seattle, Wash. If you are expanding your facilities, you will want to know how . . .

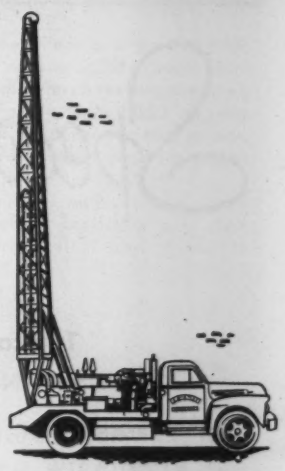
Mixed-in-Place Piles prevent vibration damage and settlement

A recent INTRUSION-PREPAKT development (patent applied for)—Mixed-in-Place Piles—is making it possible to solve difficult soil and foundation stabilization problems. A typical example is Seattle's Swedish Hospital where an addition required excavation close to existing buildings. Mixed-in-Place Piles permitted speedy completion of the project without damage from pile-driving vibrations, ground heaving or settlement.

Economical and easy-to-use, Mixed-in-Place Piles are placed by mixing Intrusion Grout with the soil in place. Soil is not withdrawn, but is used as the aggregate. The result is a pile-like column of considerable load-bearing capacity useful for soil stabilization, support piling, cutoff walls, underpinning and cofferdams.

At Swedish Hospital, 12-inch Mixed-in-Place Piles were placed tangentially along a 63-foot section and reinforced with used steel rails. Piles varied in length from 25 to 32 feet, and were left in place as the outside form for the building wall.

On many tough foundation problems, INTRUSION-PREPAKT's fresh approach has produced a cost-saving solution. It may on yours, too . . . so why not write on your letterhead for a 12-page bulletin on Mixed-in-Place Piles.



All equipment for placing Mixed-in-Place Piles is truck-mounted on a single highly mobile rig. It can operate in tight spots inaccessible to pile-driving units.

Prepakt maintains a complete field construction organization, plus an engineering service and functions as prime or sub-contractor. For further information, write: Intrusion-Prepakt, Inc., Room 779-A, Union Commerce Building, Cleveland.

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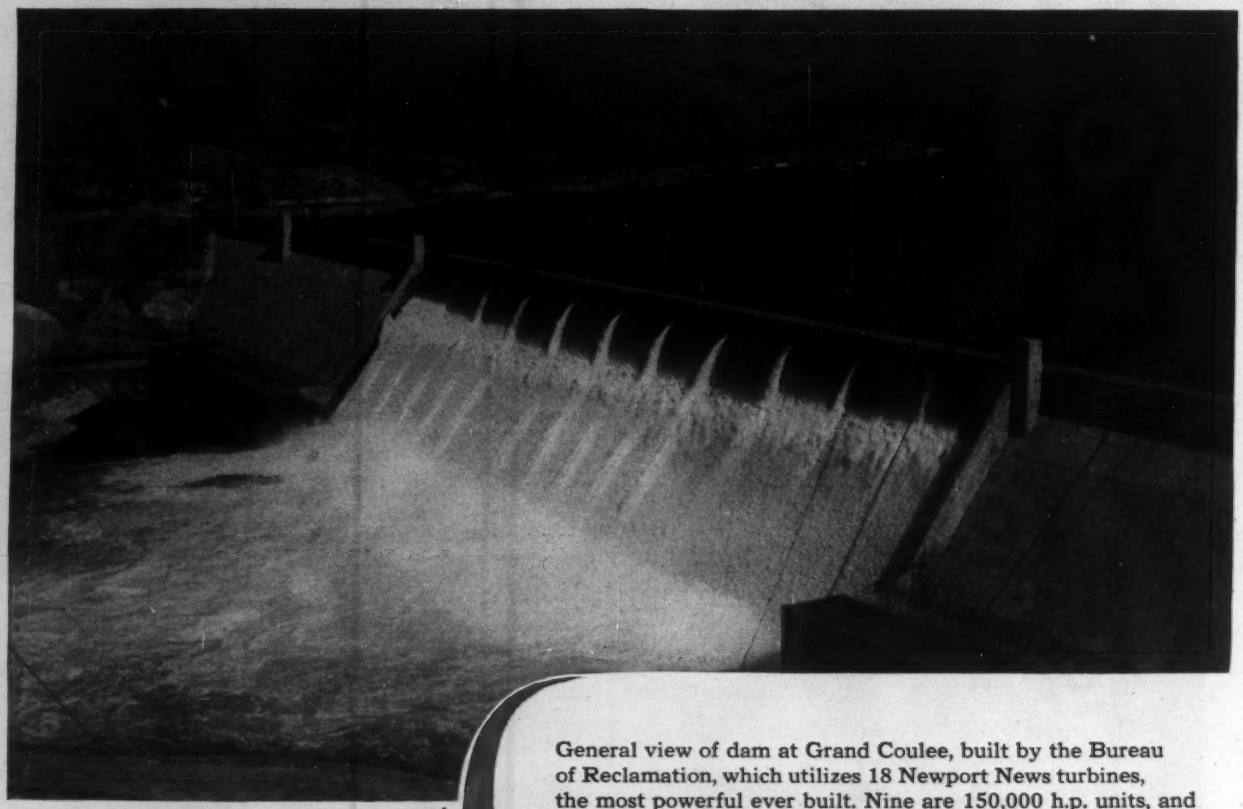

General view of dam at Grand Coulee, built by the Bureau of Reclamation, which utilizes 18 Newport News turbines, the most powerful ever built. Nine are 150,000 h.p. units, and the other nine are rated at 165,000 h.p. each.

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Turbines designed and built for the world's largest development at Grand Coulee... and for other hydroelectric installations in America and various parts of the world... bespeak the skill and facilities offered by Newport News.

This trained organization has filled hydroelectric turbine contracts with an aggregate rated output of 7,000,000 horsepower.

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Fort Patrick Henry	Tennessee
Hiwassee	Tennessee
Hoover	Nevada
J. H. Kerr	Virginia
Jim Woodruff	Florida
Lower Salmon	Idaho
Norris	Tennessee
Rock Creek	California
Santee-Cooper	South Carolina
C. J. Strike	Idaho
Whitney	Texas
Wilson	Alabama

Newport News
SHIPBUILDING AND DRY DOCK COMPANY
Newport News, Virginia

(Continued from page 130)

▲ Que., Chambly—RESIDENTIAL DEVELOPMENT—Owner, c/o Ben Ash, 590 Champagneur Ave., Montreal, plans by David Reich, 1818 Sherbrooke St. W., Montreal, residential development and shopping center, incl. 10,000 houses, sewers, roads and water services on 20 million sq. ft. land, Montreal Suburb, $90,000,000. Gabriel Hurtubise, 28 St. James St. W., Montreal, consult. engr.

Que., Ste. Genevieve de Pierrefonds—HOUSING—St. Charles Heights Development Co., 1410 Stanley St., Montreal, plans by David G. Woods, 4115 Sherbrooke St. W., Montreal, 400 bungalows, 8 models housing program, roads, sewers and water supply by owner, suburban Montreal area, $5,000,000. Lemieux & Rouleau, St. Joseph d'Alma, Que., consult. engrs. CD 3/17.

INDUSTRIAL BUILDINGS

▲ Calif., Antioch — MILL — Crown-Zellerbach Corp., 343 Sansome St., San Francisco, Calif., paper mill, near here. $10,000,000.

Calif., San Jose—BUS TERMINAL—Pacific Greyhound Lines, Market and Fremont Sts., San Francisco, bus terminal, $500,000. CD 6/13/45.

Calif., Torrance—FACTORY—Universal Enterprises, 1014 S. Broadway, Los Angeles, 100,000 sq. ft. precast concrete factory and warehouse, $500,000. Randall Eng. Co., 6101 Venice Blvd., Los Angeles, consult. engr.

▲ Ia., Newton—PLANT—Maytag Co., Newton, plant addn. $5,000,000.

▲ N. Y., Hamburg—STAMPING PLANT—Ford Motor Co., 300 Schaefer Rd., Dearborn, Mich., large addn. to Ford Div. Stamping Plant, over $5,000,000.

O., Franklin—FACTORY—Woodall Industries Inc., 7565 E. McNichols St., Detroit, Mich., factory on 12½ acre site just south of Mackinaw Addn. $550,000.

▲ Hawaii, Honolulu—REFINERY—Standard Oil of California, 225 W. Bush St., San Francisco 20, Calif., 20,000-30,000 bbl. per day refinery. $25,000,000-$30,000,000.

▲ Ont., Sarnia—PLANT—Imperial Oil Ltd., Dr. J. L. Huggett, supt., Sarnia, wax mfg. plant $4,500,000. CD 11/17/50.

UNCLASSIFIED

▲ California—GAS PUMPING STATION, etc.—Southern California Gas Co., 810 S. Flower St., Los Angeles, plans by John C. Lindsay, 827 Moraga Dr., Los Angeles, gas pumping station, compressor station, garages, offices, etc., Plaza Del Rey, Los Angeles Co., $3,000,000. CD 1/17/50.

▲ Ill., Chicago—HARBOR, etc.—Chicago Regional Port District, 160 N. La Salle St., Zone 1, harbor, dredging, channel extens., docks and warehouses $49,000,000. DeLeuw, Cather & Co., 150 N. Wacker Dr., Chicago 6, Ill., consult. engrs. CD 4/25/45.

▲ Ind., Indianapolis—TELEPHONE CABLES—Indiana Bell Telephone Co., 240 N. Meridian St., 9 cable-laying projects. $1,500,000.

Louisiana—RURAL DISTRIBUTION LINES—Valley Electric Membership Corp., Natchitoches, 249 mi. rural distr. lines, sys. imprvs., Grant Co. $500,000. CD 10/16/52.

▲ Md., Baltimore—UTILITY CONDUIT SYSTEM—City, Bureau Electric & Mechanical Services, Municipal Bldg., Zone 2, authorization a bond issue of not more than $2,000,000 approved by voters at May 3rd election for extension of utility conduit system, will have to be passed by legislature at next session. CD 11/9.

▲† Massachusetts—AAA FACILITIES—U. S. Eng., 857 Commonwealth Ave., Boston, Special AAA Facilities, Danvers, Bedford and Topsfield. $1,500,000-$1,750,000, Fay, Spofford & Thorndike, 11 Beacon St., Boston, consult. engrs. CD 2/3.

Ohio — RURAL DISTRIBUTION LINES — Hancock-Wood Electric Co-operative, North Baltimore, 3-year expansion, incl. larger transmission lines and addnl. substations, in Hancock, Wood, Putnam, Henry, Allen, Hardin, Wyandot, Seneca and Sandusky Counties. $645,000. CD 8/25/49.

▲ Oklahoma—RURAL DISTRIBUTION LINES—Kamo Electric Co-operative, Vinita, 108 mi. of 69 kv transmission lines, sub-stations and sys. imprvs., Benton Co., $1,230,000.

† Rhode Island—AAA FACILITIES—U. S. Eng., 857 Commonwealth Ave., Boston, Mass., Special AAA Facilities, North Smithfield, ENG-19-016-55-141. $800,000-$900,000. Crandall Eng. Co., 261 Franklin St., Boston, Mass., consult. engr. CD 11/25.

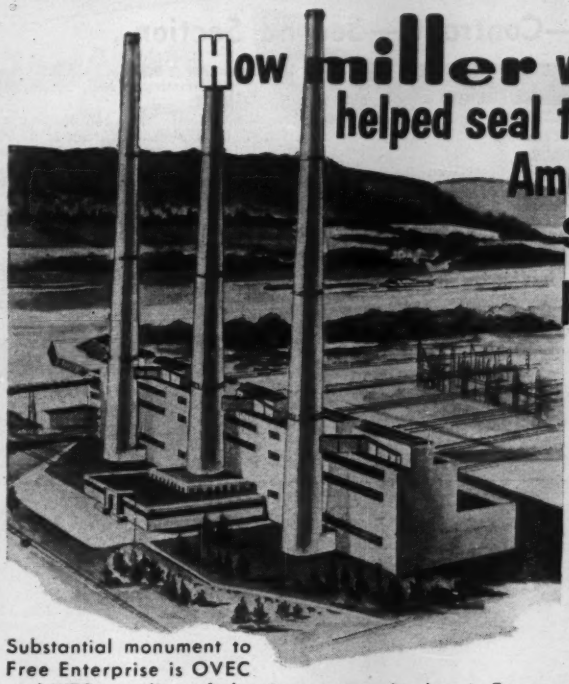
▲ Tex., Austin—COLISEUM—Travis Co., Court House, voted bonds, 10,000 permanent seats and 6,000 portable ones 350 ft. diam., 160 ft. wide, 300 ft. long coliseum, $2,500,000. Fehr & Granger & Edwin J. Pfluger, 502 E. 5 St. archts. CD 4/19.

Tex., Corpus Christi—YACHT BASIN, etc.—City, City Hall, yacht basin imprvs., $140,000; parks, $500,000; (immediate expenditure) parks, $100,000. (per year appropriation for next 4 years). R. L. Otto, city engr. CD 11/30/53.

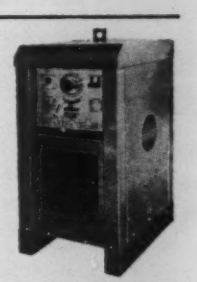
Wash., Spokane—FREIGHT YARD—Chicago, Milwaukee, St. Paul & Pacific R.R. Co., W. G. Powrie, ch. engr., Union Station, Chicago 6, Ill., 10-track freight yard. $500,000.

Alaska—RURAL DISTRIBUTION LINES—Chugach Electric Assn., P. O. Box 3518, Fairview Branch, Anchorage, transmission line, Anchorage to Portage. $500,000. R. Retherford, Anchorage, consult. engr. CD 3/16/50.

How miller welders helped seal the arteries of America's largest single purpose power plant...



Substantial monument to Free Enterprise is OVEC and IKEC, suppliers of electric power to the Atomic Energy Commission's new uranium diffusion center in Pike County, Ohio.



Miller Selenium Rectifier d-c Arc Welder, in four wide-range models. For complete, concise, worthwhile information on these and other Miller Arc and Spot Welders, contact us today ... at no obligation, of course.

Ohio Valley Electric Corporation and its subsidiary, Indiana-Kentucky Electric Corporation, agreed to supply electric power to this great new atomic production center . . . *15 billion kilowatt-hours annually.*

Two huge generating stations are being built: The Kyger Creek Plant at Cheshire, Ohio will have five generating units of 200,000 KW each; Madison, Indiana's Clifty Creek plant will produce 1,200,000 KW with its six big generators. Each of the eleven turbo-generating units will operate off a single boiler, with super-heated steam reaching 1,050 degrees Fahrenheit under 2,000 lbs. pressure per square inch! The high temperatures and reheat, which the sponsor companies have pioneered in their own right, will make these two plants among the most economical, most efficient generating stations in the country.

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NEW ENGLAND

BIDS ASKED—HEAVY CONSTRUCTION
STATE HIGHWAY LETTINGS
STREETS AND ROADS
June 1 Massachusetts June 6 Connecticut

▲† **Massachusetts**—AAA FACILITIES—BA 6/10—U. S. Eng., 857 Commonwealth Ave., Boston, Special AAA Facilities, Danvers, Topsfield and Bedford, ENG-19-016-55-140. $1,500,000. Plans deposit $50, refundable. Fay, Spofford & Thorndike, 11 Beacon St., Boston, engrs. Spector & Montgomery, Falls Church, Va., and Leon Chatelain, Jr., 1632 K St. N.W., Wash., D. C., archts. CD 5/9.

BIDS ASKED—BUILDINGS

▲ **Mass., Bridgewater**—GYMNASIUM—BA 6/3—State, Dpt. Educ., 200 Newbury St., Boston, E-509 Contr. 1, gymnasium, swimming pool. $1,180,000. Plans deposit $50, refundable. Harry Gulesian, 131 State St., Boston, archt. CD 9/2.

▲ **Mass., Cambridge**—SCHOOL—BA 6/16—City, School Dpt., 1700 Cambridge St., elementary school Granite St. $1,353,000. Carl Koch & Assoc., 55 Brattle St., Cambridge, Mass., and The Architects Collaborative, 96 Mt. Auburn St., Cambridge, Mass., archts. CD 1/5/54.

HEAVY CONSTRUCTION

LOW BIDS AND CONTRACTS

▲ **NEW HAMPSHIRE**—State Dpt. P. Wks. & Hys., Concord,
Manchester Sand, Gravel & Cement Co., P.O. Box 536, Manchester, N. H., CA $1,053,946, constr. highways and bridges, Concord, Merrimack Co. Bids May 5, awarded May 16. CD 5/10, under LB.

▲ **MASSACHUSETTS**—Massachusetts Turnpike Auth., 80 Boylston St., Boston,
M. DeMatteo Constr. Co., 200 Hancock St., Quincy, Mass. LB $7,206,511, est. $7,000,000. Contr. 51-093 hy. and bridge constr., Hopkinton, Westboro, Southbridge, Ashland and Framingham. Bids May 13. CD 4/20.

BUILDINGS

LOW BIDS AND CONTRACTS

▲ **John A. Volpe Constr. Co.**, 54 Eastern Ave., Malden, Mass. CA Approx. $1,500,000. CLASSROOM LABORATORY, Huntington Ave., BOSTON, MASS. Northeastern University, 360 Huntington Ave., Boston, Mass. Bids May 5. CD 4/15.

▲† **Merritt-Chapman & Scott Corp.**, 260 Madison Ave., New York, N. Y. LB $7,995,582, Group 1; $7,995,427, Group 2, rehabilitation ARMY BASE, South Boston, ENG-19-016-55-110, BOSTON, MASS. U. S. Eng., 857 Commonwealth Ave., Boston, Mass. Bids May 13, CD 4/27;
Raymond Concrete Pile Co., 31 St. James Ave., Boston, Mass. LB $8,210,078. Group 3, $8,736,510. Group 4 (Boston, Mass.).

▲ **Klasson & Ericson Contg. Co., Inc.**, 801 Washington St., Weymouth, Mass. Separate Contracts. $1,000,000. SHOPPING CENTER, incl. department store, stores, shops, Rtes. 3 and 18, Middle St., EAST WEYMOUTH, MASS.

MIDDLE ATLANTIC

BIDS ASKED—HEAVY CONSTRUCTION
STATE HIGHWAY LETTINGS
STREETS AND ROADS
June 2, 3 New Jersey

▲ **New York**—BA 6/3—The Power Authority of the State of New York, 270 Broadway, New York, Zone 7, channel imprvs., Galop Island South Channel, St. Lawrence Co., St. Lawrence Contr. 15. Extended date. CD 4/29.

SOON LETS CONTRACT—BUILDINGS

▲ **Md., Baltimore**—PLANT—The Glidden Co., 10999 Madison Ave., Cleveland 2, O., soon lets contract Stage 2, concrete, steel industrial plant, titanium dioxide and Sulphuric acid plant. Total est. $10,000,000. Turpin, Wachter & Assoc., 1004 N. Charles St., Baltimore, Zone 1, engrs. CD 7/26.

HEAVY CONSTRUCTION

LOW BIDS AND CONTRACTS

▲ **B. Perini & Sons, Inc.**, 73 Montwait Aye., Framingham, Mass., **Walsh Constr. Co.**, 122 E. 42 St., New York, N. Y. **Morrison-Knudsen Co., Inc.**, 122 E. 42 St., New York, N. Y. **Peter Kiewit Sons Co.**, 1024 Omaha Natl. Bank Bldg., Omaha, Neb. and **Utah Constr. Co.**, 144 E. Broadway, Salt Lake City, Utah. CA $35,849,000, constr. Barnhart Island Power Plant, near Massena, St. Lawrence Co., Spec. PA 4-11001, St. Lawrence Contr. No. 9. NEW YORK. The Power Authority of the State of New York, 270 Broadway, New York, N. Y. Bids Apr. 15. (Correction—Utah Constr. Co. address). CD 5/12, under CA.

▲ **Nicholas DiMenna & Sons, Inc.**, 1515 Blondell Ave., New York, 61, N. Y., LB $2,520,722, combined relief sewers in Williamsburg Pl. from Kent to Flushing Aves.; Flushing Ave. from Williamsburg Pl. to N. Elliott Pl.; Nassau St. from N. Elliott Pl. to Navy St.; Navy St. from Concord to Sands Sts.; Concord St. from Navy St. to point approx. 280 ft. west of Navy St.; Carlton Ave from Flushing Ave. to and across Myrtle Ave.; Myrtle Ave. north side from Carlton Ave. to Washington Park and southerly across Myrtle Ave. at Washington Park reconstr. combined sewers in Nassau and Sands Sts. each from Gold to Navy Sts.; Navy St. from Sands St. to Hudson Ave.; York St. from Hudson Ave. to Green Lane, BROOKLYN, N. Y. President Brooklyn Boro, Boro Hall, Brooklyn 1, N. Y. Bids May 17, CD 4/29.

▲ **NEW JERSEY**—State Hy. Dpt., 1035 Parkway Ave., Trenton, N. J.
N. J.—Public Constructors, Inc., Box 229, Pleasantville, N. J., LB, $1,823,301. grading, bridges, incidental paving 1.073 mi. Route 42 (North-South Freeway) from U. S. 130 to Browning Road, Gloucester City, Camden Co.;
N. J.—A. J. Cunningham & Sons, 370 Newkirk Ave., Trenton, N. J., LB $89,076, Whitehead Road extension 0.341 mi. U. S. Route 1 to Trenton Freeway, Lawrence Twp., Mercer Co.;
N. J.—M. J Stavola Inc., Box 482, Red Bank, N. J., LB, $99,988, widening and resurf. 0.5 mi. Route 35 (Section 5C) from Maple Ave. to Navesink River, Red Bank, Monmouth Co.;
N. J.—Counties Contracting & Constr. Co., 9 and Sedgley Ave., Phila., Pa., LB, $83,425, installing underground structures for traffic signals sys. at various intersections of N. J. State Hys. Bids May 17. CD 4/27.

▲ **PENNSYLVANIA**—Pennsylvania Turnpike Comn., 11 N. 4 St., Harrisburg,
Gasparini Excavating Co., Inc., Peckville, Pa., LB $2,102,632, constr. 2.87 mi. (Sec. 37-1) Northeastern Exten., Pittston Twp. and DuPont Boro, Luzerne Co. Bids May 18. CD 4/29.

BUILDINGS

LOW BIDS AND CONTRACTS

▲ **Brookville Farms Homes**, c/o Herman H. York, archt., 90-04 161 St., Jamaica, N. Y. Owner Builds. $1,500,000. 100 HOUSES, Pulaski Rd., near Larkfield Rd. on 62-acre tract, EAST NORTHPORT, N. Y.
▲ **Marlen Homes**, c/o Herman H. York, archt., 90-04 161 St., Jamaica, N. Y. Owner Builds. $1,350,000. 85 HOUSES, 50-acre tract, Fifth Ave. near Larkfield Rd., EAST NORTHPORT, N. Y.
▲ **Wm. E. Cramer**, 2601 Connecticut Ave., N. W., Wash., D. C. CA $2,260,000. Northwest Bethesda HIGH SCHOOL, Bethesda, ROCKVILLE, MD. Mont-

(Continued on page 136)

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Send for Bulletin TVC-300 E

Condensate Pumps featuring

- LOW RETURN CONNECTION
- LOW SPEED — LONG LIFE
- CAST IRON RECEIVER
- LOW WATER LINE

Duplex Unit
25½" Diameter Receiver

Duplex units, with automatic alternators, furnish "extra" insurance, provide overload protection and guarantee an even longer life. Height of return above floor is 7 1/16".

Fig. No. 303 B

Single Unit
21" Diameter Receiver

Fig. No. 302 A

Height of return is only 6⅞" above floor.

Single units of any rating can also be furnished in the 25½" diameter receiver. This receiver is furnished machined and drilled for the addition of another pump and control so as to enable conversion to a duplex unit at a later date.

Capacities From
500 to 10,000 sq. ft. E.D.R.
Up to 30 lbs. discharge pressure

TVC Condensate Pumps are low speed (1750 RPM) for long life, are easily installed (two piping connections) in areas where space is important. The cast iron receiver and sturdy pumping unit (equipped with a dirt strainer), all completely factory assembled and tested, assure a long lived trouble-free installation.

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PHOTO COURTESY CONCRETE TRANSPORT MIXER CO., ST. LOUIS, MISSOURI

CHRYSLER *with gýrol Fluid Coupling . . . powers the Rocket, saves weight for added payload, protects equipment*

Off and running with the new building season is this 4½-cubic-yard Rocket Transit Mixer. It is pouring concrete for a dwelling basement in Youngstown, Ohio.

The operator stands at the controls grouped at the rear of the mixer. Hydraulically controlled chute with aluminum extension enables fast, onto-the-spot discharge. An electrical revolution counter enables operator to regulate mixing action to meet highly specialized requirements. The Rocket Mixer employs a continuous blade design claimed to give faster, more efficient mixing action.

Up front behind the truck cab, the Rocket packs a Chrysler Industrial 30 Engine—part of its standard equipment. Between engine and Chrysler-supplied three-speed transmission is the highly regarded Chrysler gýrol Fluid Coupling. Equipped in this manner, the Rocket Mixer offers its users a 230-cubic-inch displacement engine—an engine with ample power, yet lightweight to permit maximum payloads. Chrysler gýrol Fluid Coupling transmits engine power smoothly, at the same time absorbing shock loads, protecting engine and drive line, adding years to the life of the equipment.

In selecting Chrysler Industrial Engines to power their equipment, manufacturers know they can specify Chrysler Engines factory-equipped to meet their needs. An extra large selection of optional equipment is available for their choosing.

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CHRYSLER INDUSTRIAL 30 Engine
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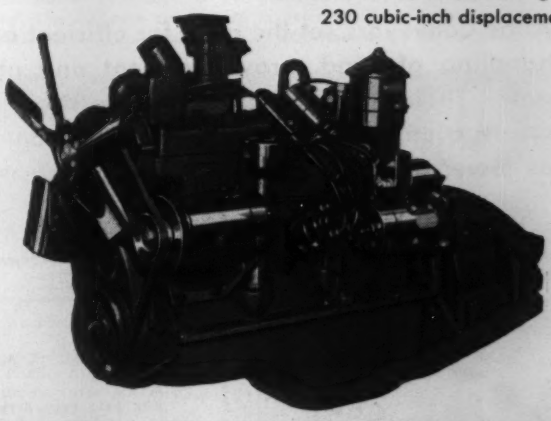

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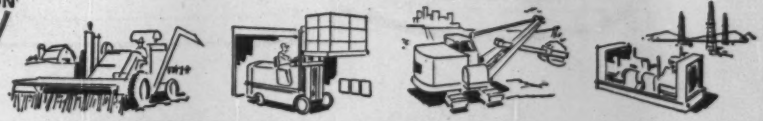


AGRICULTURE • INDUSTRY • CONSTRUCTION • OIL FIELDS

(Continued from page 134)

gomery Co. Bd. Educ., Rockville, Md. ●CD 5/16, under LB.

▲ **Geeraert Constr. Corp.**, 1600 Viers Mill Rd., Rockville, Md. Owner Builds, $3,000,000. Twinbrook SHOPPING CENTER, on Viers Mills Rd., ROCKVILLE, MD. John Samperton, 80022 Wisconsin Ave., Bethesda, Md., archt.

▲ **Irons & Reynolds, Inc.**, 1724 H St. N.W., Wash., D. C., CA Est. $2,000,000. 3 story RETAIL STORE, Good Hope and Naylor Rd. S.E., WASH., D. C. Sears, Roebuck & Co., 911 Bladensburg Road N.E., Wash., D. C. The Ballinger Co., 121 N. Broad St., Phila., Pa., archt. Bids Apr. 26. CD 4/25.

SOUTH

BIDS ASKED—HEAVY CONSTRUCTION
STATE HIGHWAY LETTINGS
BRIDGES

June 2 Tennessee — June 7 Virginia

STREETS AND ROADS
June 2 Tennessee

BIDS ASKED—BUILDINGS

▲† **Ky., Fort Campbell**—HOUSING—BA On Or About 6/21—U. S. Eng., 306 Federal Office Bldg., Nashville, Tenn., 300 family housing units, utilities, $3,000,000. Plans deposit $25. CD 7/9/51.

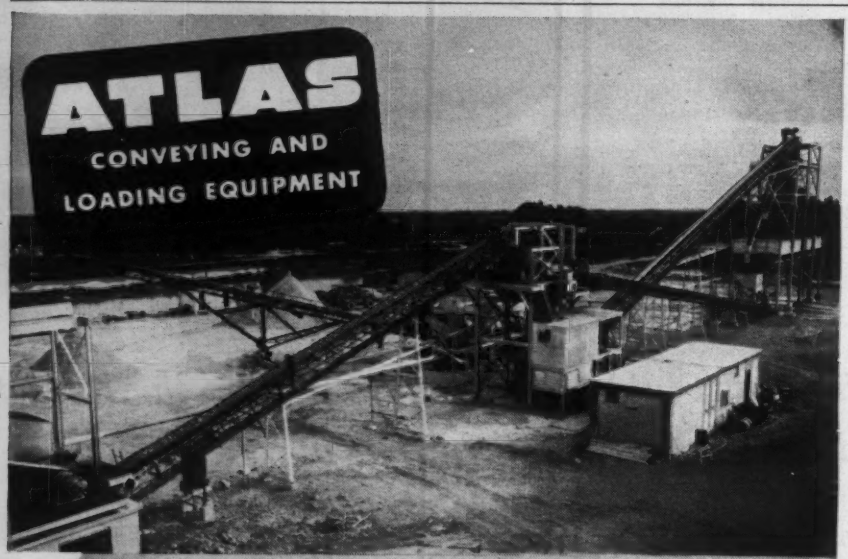
BUILDINGS

LOW BIDS AND CONTRACTS

▲ **Southern Commerical Constr. Co.**, Inc., 1341 Pennsylvania Ave. S.E, Wash., D. C. CA $1,318,000. Kenmore JUNIOR HIGH SCHOOL, ARLINGTON, VA. Arlington Co., Bd. Educ., 1426 N. Quincy St., Arlington, Va. CD 5/9, under LB.

▲ **United Engineers & Constructors, Inc.**, 1401 Arch St., Phila., Pa., CA, $15,000,000. design and construct, plan to manufacture aniline oil, MOUNDSVILLE, W. VA. National Aniline Div., Allied Chemical & Dye Corp., 40 Rector St., New York, N. Y. CD 8/7/52.

▲ **Fuller & Peacock, Inc.**, 3182 Peachtree Rd. N.E., Atlanta, Ga. LB $1,348,000. Newton Elementary and High School for colored; Covington Elementary SCHOOL; Washington Street Elementary SCHOOL addn.; Livingston Elementary SCHOOL; Mansfield Elementary SCHOOL; Palmer-Stone Elementary SCHOOL; Newton County High SCHOOL addn. and East Newton Elementary SCHOOL all in Newton County, COVINGTON, GA. State School Bldg. Auth., Kemper Bldg., 41 Exchange Pl. SE., Atlanta, Ga. Bids May 17. CD 4/14.



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MIDDLE WEST

BIDS ASKED—HEAVY CONSTRUCTION
STATE HIGHWAY LETTINGS
BRIDGES
June 7 Wisconsin
STREETS AND ROADS
June 7 Wisconsin — June 21 Ohio

▲ **O., Cincinnati**—BA 5/31—City, City Hall, Contr. No. 5, (sludge driers and incinerators) for Mill Creek Sewage Plant. $1,200,000. Plans deposit $25. Extended date. Havens & Emerson, Leader Bldg., Cleveland, consult. engrs. CD 4/26.

▲ **Ill., Chicago**—BA 6/10—City, City Hall, three sections of water tunnels and shafts connecting to Chicago Ave. Water Tunnel and Wilson Ave. Water Tunnel for Central District Filtration plant incl. Spec. 80.391-55-1, Section "A", four shafts in area 400 ft. 1,800 ft. north of Navy pier and from Lake Shore Dr. to point approx. 2,000 ft. east; Spec. 80.391-55-2; Section "B" shaft in park area southeast of Belmont Harbor on approx. line of Wellington Ave. extended, two lengths of 16 ft. tunnel in rock total length approx. 14,300 ft. one extending southeasterly to connection with Tunnel Section "A" and other extending northwesterly to connection with Tunnel Section "C", Spec. 80.391-55-3; Section "C" two shafts in Park area south of Wilson Ave. and east of Clarendon Ave. two 16 ft. tunnels in rock with total length approx. 4,700 ft.; one tunnel in rock one tunnel in clay I by-pass structure. Plans deposit $50 for each section, $14,-993,060. Extended date. C 4/26.

BIDS ASKED—BUILDINGS

▲ **Ill., Chicago**—HOUSING—BA 6/7—Chicago Housing Auth., 608 S. Dearborn St., Zone 5, five 325-unit apartments at Lake St. and Hermitage, Henry Horner Homes, $3,000,000. Skidmore, Owings & Merrill, 100 W. Monroe St., Chicago, Zone 3, archts. CD 2/2/50.

▲ **Mich., Pontiac**—SCHOOL—BA 6/7—City, Lola B. King, secy., Bd. Educ., 40 Patterson St., 1 and 2 story, 82,000 sq. ft. Junior High School, Perry and Madison Sts. $1,500,000, H. E. Beyster & Assoc., 700 Griswold Bldg., Detroit, archts. CD 10/4.

▲ **Ill., Des Plaines**—WAREHOUSE, etc.—Bids Asked—Butler Brothers, 111 N. Canal St., Chicago, Zone 6, 353,280 sq. ft. warehouse, 12,000 sq. ft. office, Wolf Rd. and Algonquin St. $2,500,000. F. H. Wells, 173 W. Madison Ave., Chicago, Zone 2, engrs. CD 12/9.

▲ **Ill., Elmhurst**—SHOPPING CENTER—Bids Asked—Cottage Hill Shopping Center, c/o L. J. Sheridan, 111 W. Washington St., Chicago, Zone 2, shopping center, $2,500,000. Jensen & Halsted, 228 N. LaSalle St., Chicago, Zone 1, archts. CD 12/20.

HEAVY CONSTRUCTION

LOW BIDS AND CONTRACTS

▲ **OHIO**—State Hy. Dpt., Columbus, Zone 15,

O.—**Twin Constr. Co.**, R.F.D. No. 3, Chillicothe, O. LB $82,953, est. $94,300, Type T-35 on B-119 and structure 0.244 mi. SR 380-9.85, S-1120 (3), Clinton Co.;

O.—**Brewer & Brewer Sons, Inc.**, P. O. Box 88, Chillicothe, O., LB $206,655, est. $234,700, Type T-35 and structures 0.701 mi. SR 75-(15.69-16.00), U-313 (2), City of Jackson, Jackson Co.;

O.—**Launder & Pierce** (Launder & Sons, Inc. and Pierce Constr. Co.), Box 56 Swanton, O., LB $2,189,878, est. $2,739,800, Type T-71 and structures 4.253 mi. SR 120-0.00, 8.38, UI-1052 (12), Part No. 8-Toledo Expressway System, Lucas and Wood Counties.;

O—**The Murray Constr. Co.**, P.O. Box 231, Waverly, O. LB $140,154, est. $153,500, Type T-35 on B-119 and structure 0.606 mi. SR 56-23.76, S-142 (3), Village of Mt. Sterling, Madison Co.;

O.—**Herman B. Hune**, Box 284, Marietta, O., LB $338,-704, est. $367,200, Type T-35 on B-119 and structure 2.861 mi. SR 335-(8.13-8.94) (10.12), S-1153 (2), Scioto Co.;

O.—**The McCourt Constr. Co.**, 720 Home Ave., Akron, O. LB $102,770, est. $110,700, Type T-35 2.409 mi. CR No. 133-B, S-215 (3), Summit Co.;

O.—**C. F. Replogle**, Box 308, Circleville, O., LB $453,-322, est. $662,500, Type T-35 on B-119 3.12 mi. SR 3-(0.00-2.40), 33.93, Ashland and Knox Counties; LB $510,037, est. $506,500, Type T-35 and structure 1.702 mi. USR 40-(5.64-7.10), Belmont Co.;

O.—**Great Lakes Constr. Co. and National Engineering & Contg. Co.**, Box 2278, Brooklyn Station, Cleveland, O., LB $1,956,090, est. $2,241,700, Type T-71 and structures 2.895 mi. SR 17-14.99, Village of Brooklyn Heights, Village of Independence, City of Cleveland, City of Parma, Cuyahoga Co.;

O.—**The Wm. L. Schloss Paving Co.**, 9521 Woodland Ave., Cleveland, O., LB $95,869, est. $110,200, Type T-35, 5.135 mi. SR 94-0.00, Village of North Royalton, City of Parma, Cuyahoga Co.;

O.—**Rhoten Constr. Co.**, 16 E. Broad St., Columbus, O. LB $464,900, est. $506,000, Type T-35, 5.186 mi. SR 37-(5.07-5.17), Village of Johnstown, Licking Co.; LB $625,982, est. $622,100, Type T-35 and structure 6.185 mi. SR 29-(0.00-3.31), Mercer Co.;

O.—**J. D. Fowler Co.**, 285 Andrews Ave., Youngstown, O. LB $217,230, est. $249,200, Type T-71, 0.255 mi. USR 422-(3.22-3.37), City of Youngstown, Mahoning Co.;

(Continued on page 138)

"The only machines that can work here," says Dave Carey of his Tournapulls

Each "D" moves 50 yards of heavy wet clay hourly over sponge-soft footing

CAREY BROTHERS, San Anselmo, California, had to move between 400,000 and 500,000 yards of clay on street construction, lot leveling, and landscaping for Terra Linda Subdivision, 2 miles north of San Rafael. With their fleet of 3 electric-control C Tournapulls busy at Corte Madera, they assigned all dirtmoving to 2 side-boarded D Tournapulls and an old Super C Tournapull.

25 trips hourly on 1000′ hauls

Much of the work was done following heavy rain. This made the clay wet, soft, and very heavy. In order to prevent the material from peeling up in big chunks, and to make spreading easier, Tournapulls loaded in thin lifts averaging 100′ in length. With aid of a 148 hp pusher, "D" loads averaged 6 pay yards. Over typical 2,000′ cycles, output for each "D" averaged 12 to 13 loads (72 to 78 pay yards) per 55-minute hour. Total hourly production for the 2 machines was 144 to 156 pay yards on this 2,000′ cycle. Partner David Carey says that, over the duration of the job on haul distances up to 3,000 ft., the 2 "D's" moved an average of 100 pay yards hourly. He adds, "Tournapulls are the only machines that had the traction and flotation to work this job. They drove easily over the very soft ground. They proved well-built and had little downtime. We also found them to be very versatile."

Drives 28 mph job-to-job

Previous jobs for Carey's 2 D Tournapulls included a total of 200,000 cubic yards on 3 northern California state highway contracts. All job-to-job moves were made under units' own power. Most of the time, they drove over main highways at full throttle, 25 to 28 mph, right along with the regular heavy truck and auto traffic.

According to company records, each "D" has worked more than 3,000 hours in 1½ years. Mechanical efficiency for this entire period has been 90%. Operator Bruce Burch declares, "These rigs are easy to handle and easy to maintain."

With pusher assistance, D 'Pull picks up 6 pay yards of water-soaked clay. The 400-acre subdivision is being built on a former 1,500-acre ranch. During the next 4 years, 4,000 homes will be constructed here.

Tournapull—Trademark Reg. U. S. Pat. Off. PDP-674-Hb

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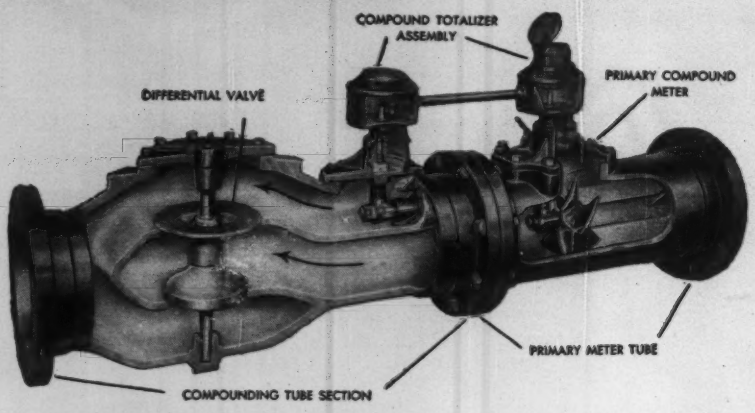

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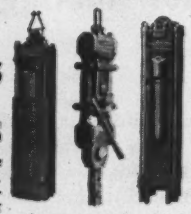

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(Continued from page 136)

O.—**S. E. Johnson Co.**, Box 29, Maumee, O., LB $175,549, est. $164,500, Type T-35 on B-119, 1.878 mi. USR 224.6 13 (15.72), (18.24), Putnam and Van Wert Counties; LB $581,675, est. $551,300, Type T-35 and structures 6.895 mi. USR 6-(0.00-6.26), (Sandusky-Wood), Village of Helena, Sandusky Co.;

O.—**Holmes Constr. Co.**, Palmer St., Wooster, O., LB $174,034, est. $184,000. Parts Nos. 1 and 2, Village of Smithville, Wayne Co.;

O.—received no bids May 10, Type T-35 on B-119, 0.219 mi. SR 91-14.40, Village of Hudson, Summit Co. Bids May 10. CD 4/4.

▲† **Ralph Rogers & Co., Inc.**, S. Adams St., Bloomington, Ind., CA $1,184,864, paving and processing of roadways, surface drives, parking lots, bldg. exterior areas, b. conc. on waterbound macad. base; processing approx. 200,000 sq. yd. with oil stone surf., etc., at Portsmouth, OHIO. Atomic Energy Comn., 1901 Constitution Ave., N. W., Wash. 25, D. C. CD 8/13/52, under Public Buildings, under CA.

▲ **INDIANA**—Indiana Toll Road Comn., 309 W. Washington St., Old Trails Bldg., Indianapolis,

Sollitt Constr. Co., 301 Columbia St., South Bend, Ind., LB, $1,655,530. 5 maintenance bldgs. M-1, west of Chesterton, Porter Co.; M-2, south of U.S. Route 20 on Fall Rd., La Porte Co.; M-3, north of U.S. Route 20 on Ash Rd., St. Joseph Co.; M-4, east of Scott, La Grange Co.; M-5, east of Orland, Steuben Co. Bids May 4. CD 4/13.

▲† **Sumner Sollitt Co.**, 307 Michigan Ave., Chicago, Zone 1, Ill., LB, $1,568,000. boiling reactor experimental facilities, LEMONT, ILL. Atomic Energy Com., P.O. Box 59, Lemont, Ill. Sargent & Lundy, 140 S. Dearborn St., Chicago 2, Ill., engrs.

BUILDINGS

LOW BIDS AND CONTRACTS

▲ **Anthony Visconsi**, 1010 Euclid Bldg., Cleveland, O. Owner Builds. $2,500,000. SHOPPING CENTER, providing space for 35 shops on 36-acre tract, at Pleasant Valley and Broadview Rds., parking for 1,500 cars, PARMA, O.

▲ **Hunkin-Conkey Constr. Co.**, 1740 E. 12 St., Cleveland, O., CA, site preparation and sub-structure work, for 690,000 sq. ft. automotive parts PLANT, SANDUSKY, O., total est. $7,500,000. Ford Motor Co., 3000 Schaefer St., Dearborn, Mich. CD 3/3;
Taylor & Gaskin, Inc., 2210 Park St., Detroit, Mich., fabricate and erect steel (Sandusky, O.);
Rust Engineering Co., 575 6th Ave., Pittsburgh, Pa., CA, design and build boiler house (Sandusky, O.).

▲ **Coronet Constr. Co.**, 8836 Brookfield St., Brookfield, Ill., Own Forces, $1,100,000. 70 HOMES, BROOKFIELD, ILL.

▲ **Crane & Moreland**, 6250 S. Central St., Chicago, Ill. Own Forces. $6,400,000. 400 HOMES, DOLTON, ILL.

▲ **Comet Constr. Co.**, 1848 N. Milwaukee St., Chicago, Ill. Own Forces. $1,000,000. 45 HOMES, SKOKIE, ILL. Peter J. Nitto, 507 Lee St., Evanston, Ill., archt.

▲ **Hollywood Builders**, 3454 Devon St., Chicago, Ill., Own Forces, $3,000,000. 150 HOMES, WILMETTE, ILL.

▲ **Multi-Lakes Realty Co.**, 3060 S. Commerce Rd., Walled Lake, Mich. Owner Builds. $2,000,000. Golf View Subdivision, 67 HOMES, Long Lake Rd., near KEEGO HARBOR, MICH.

WEST OF MISSISSIPPI

BIDS ASKED—HEAVY CONSTRUCTION
STATE HIGHWAY LETTINGS
BRIDGES

May 31 Iowa — June 2 Missouri
June 7 Kansas — June 14, 15 Texas

STREETS AND ROADS

May 31 Iowa — June 2, 7 Kansas
June 2 Missouri — June 3 Minnesota
June 14, 15 Texas

▲ **Tex., Galveston**—BA 6/13—City, City Hall, constr. 1st phase of Causeway and railway bridge with movable span to connect Galveston Island with Pelecan Island. $2,300,000. Plans deposit $50. Parsons, Brinckerhoff, Hall & Macdonald, Bankers Mortgage Bldg., Houston, engrs. CD 12/9.

▲† **Tex., San Antonio**—AEROMEDICAL CENTER—BA 6/23—U. S. Eng., Box 1229, Galveston, constr. School of Aviation Medicine, Flight Medicine Laboratory and Research Laboratory Shops, Brooks Air Force Base, ENG-41-243-55-41. $1,000,000- $3,000,000. CD 7/28/53.

BIDS ASKED BUILDINGS

▲ **Mont., Butte**—SCHOOL—BA 6/9—Butte School Dist. No. 1, constr. Junior High School, $2,450,000. J. G. Link & Co., 111 N. Montana St., archts. CD 11/2/53.

▲† **Tex., Fort Hood and Killeen**—HOUSING—BA 6/16—U. S. Eng., 100 W. Vickery Blvd., Fort Worth, construct, manage and finance, 203 unit housing, ENG-41-443-55-132. $2,500,000. CD 4/15.

▲ **Tex., El Paso**—COUNTY —BA 6/21—City of El Paso, Fred Harvey, mayor, and El Paso County, c/o Hugh McGovern, Jr., judge, El Paso, two new wings of county bldg. of 8 storys each, remodeling of jail, 4 story, 260x260 ft. $3,000,000. Plans deposit $70. Monroe, Licht & Higgins, 827 E. Yandell Blvd., archts. Landauer & Shafer, 4801 Lemmon St., Dallas, engrs. CD 12/13.

▲ **Tex., Pasadena**—PLANT etc.—Bids Asked—Phillips Chemical Co., City Natl. Bank Bldg., Houston, marlex (new polyethylene plastic) production plant,

(Continued on page 140)

Tractor-on-rubber spreads 30 to 35 truck-loads hourly for New York Thruway

To speed their work on the Herkimer Section of the New York Thruway, east of Utica, L. G. DeFelice & Son, Inc., North Haven, Connecticut, brought in a 186 hp rubber-tired Tournatractor.

360 to 420 yards hourly

This new unit is now helping move 4,000,000 yards of sand, clay, earth and shale. Some of the time, it works alongside the Erie Canal, where a dragline is excavating 15 to 20′ of muck to provide a stable base for the road. Tournatractor's job here is to backfill sand and gravel brought in by dump trucks. In typical operation, it spreads 30 to 35 loads (360 to 420 yards) hourly. Pushes vary from a few feet to 300 feet one-way. Dozer loads average 2½ yards each. Compaction is attained by rolling action of tires, plus back-blading with down-pressure on return portion of each cycle.

All-purpose tool

When caught up on this phase of the work, Tournatractor speeds at 19 mph to handle a wide variety of odd-lot assignments. In addition to backfilling, it helps other tractors spread scraper-dumped dirt . . . tows compressors and other equipment . . . cleans haul roads . . . and pushes or pulls trucks out of the mud. In final stages of earthmoving, Tournatractor will tow a 50-ton rubber-tired compactor.

"I like the Tournatractor very much as a push-tractor," says Foreman James Perkins. "It's also tops for spreading truck-dumped loads."

"I like Tournatractor's maneuverability," says Operator Charles L. Curran. "That down-pressure is really okay for back-blading."

Ask for a demonstration

No matter what size equipment fleet you have, no matter whether you move dirt with scrapers or trucks — or both — you'll find these three major Tournatractor advantages well worth considering:

1. Tournatractor's fast pushing speed, instant gear changes and 8 mph reverse enable it to do twice as much work as a crawler-tractor on most jobs.
2. Tournatractor reduces travel time between jobs by driving anywhere under its own power at speeds up to 19 mph.
3. Its four single-wheel units, with power traveling on sealed anti-frictions, require much less maintenance than crawlers with their 450 to 550 moving parts.

But check these advantages for yourself. Let us demonstrate a new, more powerful 208 hp Tournatractor on your job. Call or write us to arrange time and place.

Tournatractor—Trademark T-614-H-b

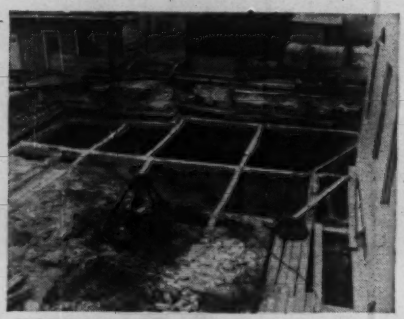
LeTourneau-Westinghouse Company

PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

HOW TO HANDLE
WET JOBS

ADDITION TO
TELEPHONE BUILDING
Newport News, Va.
Contractor: Wise Contructing Co.



BOTTOM VERY UNSTABLE. Open pumping caused sheeting to collapse. View shows job shut down after second attempt to sheet hole.

WITH WELLPOINTS. Job is bone-dry, bottom firm and stable—Griffin Wellpoint system (see pumps, top of photo) holding ground water 3 ft below subgrade.

TIGHT FINE SAND with silty clay binder . . . precarious jetting conditions . . . "pinched-in" working space . . . these were only some of the problems. Griffin skills solved them all, speedily and economically.

GRIFFIN
WELLPOINT CORP.
881 East 141st Street, New York 54, N. Y.
Hammond, Ind. Houston, Tex. Jacksonville, Fla.
In Canada: Construction Equipment Co., Ltd.
Toronto Montreal Halifax

(Continued from page 138)

$15,000,000; products pipe line between Pasadena and Sweeny, $375,000. CD 5/6.

▲ **Tex., Sweeny**—PLANT—Bids Asked—Phillips Chemical Co., City Natl. Bank Bldg., Houston, ethylene plant, $10,000,000. CD 5/5.

HEAVY CONSTRUCTION

LOW BIDS AND CONTRACTS

▲ **MINNESOTA**—State Hy. Dpt., 1246 University Ave., St. Paul, Minn.—**O. B. Ashbach & Sons**, 2975 Hamline Ave. North, St. Paul, Minn. LB **$1,241,762.** c. conc. 17.2 mi., in Worthington on TH 60 and between Worthington and Fulda on TH 59, Murray and Nobles Counties; Minn.—**Johnson Constr. Co.**, Litchfield, Minn. LB **$941,029** base, road-mixed bit. surf. 9.8 mi. between South Jct. TH 43 at Rushford and 0.8 mi. west of Houston, Fillmore and Houston Counties; Minn.—**McCree & Co.**, New York Bldg., St. Paul, Minn. LB **$907,094.** c. conc. 11.2 mi. between North St. in Jackson and 1 mi. south of Bergen, Jackson Co.; Minn.—**E. W. Coons, Inc.**, Hibbing, Minn. LB **$751,192.** base, plant-mixed bit. surf. 11.3 mi. between Virginia and Biwabik and between Eveleth and Gilbert, St. Louis Co.; Minn.—**Moen Bros.**, Moorhead, Minn. LB **$524,051.** base, road-mixed bit. surf. 12 mi. between Gemmell and Margie, Koochiching Co.; Minn.—**Anderson Bros.**, Brainerd, Minn. LB **$104,664.** grav. base, road-mixed bit. surf. 6 mi. between 6 mi. south of South Jct. TH 34 and south Jct. TH 34, Cass Co.; Minn.—**Duininck Bros.** and Gilchrist, Olivia, Minn. LB **$134,951.** grav. base, c. conc. plant-mixed bit. surf. 1.5 mi. in Marshall, Lyon Co.; Minn.—**Herbison Constr. Co.**, Brainerd, Minn. LB **$447,917,** base, road-mixed bit. surf. 11.4 mi. between West State Line and Donaldson, Kittson Co.; LB $294,001. base, road-mixed bit. surf. 11.6 mi., between Thief River Falls and Holt, Marshall and Pennington Counties; LB **$340,022.** base, plant-mixed bit. surf. 20.2 mi. between Erhard and Pelican Rapids on TH 59 and between Lawndale and Pelican Rapids on TH 108, Otter Tail and Wilkin Counties; Minn.—**Hodgman & Sons**, Fairmont, Minn. LB **$363,472.** grav. base, c. conc. plant-mixed bit. surf. 2.9 mi. in Elmore 2 mi. west of Sherburn and in Fairmont, Faribault and Martin Counties; Minn.—**Jeffries Constr. Co.**, Mankato, Minn. LB $192,363. grav. base, plant-mixed bit. surf. 14.7 mi. between Cambria and Jct. TH 169, Blue Earth Co.; Minn.—**L. Joyce**, Rochester, Minn. LB **$447,887,** crushed rock base, surf. 6.8 mi. between Chatfield and 2 mi. west of Pilot Mound, Fillmore and Olmstead Counties; Minn.—**Megarry Bros.**, St. Cloud, Minn. LB **$185,599.** grav. base, plant-mixed bit. surf. 11.2 mi. between Erskine and Brooks, Polk and Red Lake Counties. Bids May 13. CD 4/27.

▲† **Westinghouse Electric Corp.**, 707 Boyle Bldg., Little Rock, Ark. CA **$1,466,320.** installing 2 main generators Table Rock Dam, Taney Co., CIVENG-03-050-55-37, MISSOURI. U. S. Eng., P. O. Box 867, Little Rock, Ark. CD 3/23, under LB.

BUILDINGS

LOW BIDS AND CONTRACTS

▲ **Massman-Patti Companies** (Massman Constr. Co., 1221 Baltimore St., Kansas City, Mo. and S. Patti Constr. Co., 1340 Admiral St., Kansas City, Mo.). joint venture. CA Est. **$1,750,000.** Harry S. Truman LIBRARY, INDEPENDENCE, MO. Truman Memorial Library, c/o Bd. Trustees, Independence, Mo. CD 7/13.

▲ **Long Constr. Co.**, Rialto Bldg., Kansas City, Mo. CA Est. **$1,500,000.** L-shaped OFFICE on site of old Muehlebach Brewery 18 St. between Main and Baltimore Sts., incl. 3 story bldgs. to accommodate helicopter landings, for T.W.A., KANSAS CITY, MO. Kansas iCty Life Insurance Co., 3250 Broadway, Kansas City, Mo. Awarded May 5.

▲ **The Fluor Corp. Ltd**, 2500 Atlantic St., Los Angeles, Calif., CA Est. **$3,000,000.** design and construct GASOLINE PLANT facilities, incl. compression facilities comprising five 2,000-HP compressors; gas processing and dehydration facilities; storage facilities for liquid products incl. propane, iso-butane, normal butane and gasoline; electrical generator facilities; boilers and auxiliaries; water treatment facilities in Coke Co., TEXAS. Texas Natural Gasoline Corp., Box 1409, Tulsa, Okla. CD 2/15.

▲ **Mosher Steel Co.**, 5101 Maple St., Dallas, Tex., CA Approx. **$1,750,000.** furnishing, erecting structural steel for new POT ROOMS, Rockdale, PORT LAVACA, TEX. Alcoa Aluminum Co. of America, J. D. Harper, Rockdale Wks. Mgr., Rockdale, Tex., and Commerce Bldg., Houston, Tex. CD 3/1.

▲ **Arch M. Sellery**, 1759 S. Jackson St., Casper, Wyo. Separate Contracts. **$1,800,000.** 100 brick HOUSING, CASPER, WYO. J. Robert Bence & George Stein, 143 S. Center St., Casper, Wyo., engrs.-archts.

▲ **Panorama Heights Development Corp.**, Byron Wells, pres., Boulder, Colo. Separate Contracts. **$2,000,000.** subdivision, 190 BUILDING SITES, BOULDER, COLO.

▲ **Western States Constr. Corp.**, 1229 S. LaBrea St., Los Angeles, Calif. Owner Builds. **$3,000,000.** 180 HOME DEVELOPMENT, GRAND JUNCTION, COLO.

FAR WEST

BIDS ASKED—HEAVY CONSTRUCTION
STATE HIGHWAY LETTINGS
BRIDGES
June 7 Idaho June 8 California
STREETS AND ROADS
June 7 Idaho June 8, 9, 15, 16 California

BIDS ASKED BUILDINGS

▲ **Calif., Spadra** — HOSPITAL — BA 6/8 — State Div. Architecture, 1100 S. Grand Ave., Los Angeles, Pacific State Hospital alterations, addns. $2,000,000.

BUILDINGS

LOW BIDS AND CONTRACTS

▲ **Lagerquist Brothers Inc. & R. E. McCormick & Sons**, 2920 Blakeley St., Seattle, Wash., Day Labor, **$1,500,000.** 34 HOUSES, BELLEVUE, WASH. CD 3/7.

▲† **Macdonald Bldg. Co.**, 1517 S. Tacoma Way Tacoma, Wash., CA, **$1,684,202.** imprvs. temporary mobilization-type BARRACKS, BOQs and MESS HALLS, Inv. 55-122, FORT LEWIS, WASH. Dpt. Army, Purch. & Contg. Officer Fort Lewis, Wash. Bids Apr. 15. CD 4/20, under LB.

▲ **Pacific Woods Constr. Co.**, c/o Rushing Fisher & Assocs., engrs., 17962 Aurora Ave., Seattle, Wash., Day Labor, **$2,500,000,** 119 HOUSES, KENMORE, WASH. R. R. Campbell, 518 1 Ave. N., Seattle, Wash., archt. CD 4/22.

▲† **George A. Fuller Co.**, 3100 W. 8 St., Los Angeles, Calif. LB **$2,419,253,** hot test acceptance facility rocket engine field LABORATORY, Phase 11 at Santa Susana, CALIFORNIA. North American Aviation, Inc., 12214 Lakewood Blvd., Downey, Calif. Bids May 16.

▲ **Brightwood Constr. Co.**, 1003 Katella St. Anaheim. Calif., CA **$1,784,720.** 220 frame, stucco DWELLINGS, La Jora St. St. Obispo Ave. and Poppy St., LONG BEACH, CALIF. Vista Park Homes No. 2, 10031 Katella St., Anaheim, Calif.

▲ **Chapman Builders**, 1501 Arryo Ave., San Carlos, Calif., CA, **$1,500,000.** 75 HOMES subdivision, SAN CARLOS, CALIF. Economy Builders, c/o contractors. CD 9/11/52.

CANADA

BIDS ASKED—HEAVY CONSTRUCTION
STATE HIGHWAY LETTINGS
STREETS AND ROADS
June 10 British Columbia

BIDS ASKED—BUILDINGS

▲ **B. C., Vancouver**—ACUTE—BA 8/9—Vancouver General Hospital, 12 and Heather Sts., 504-bed concrete, rein.-con. acute bldg. $8,000,000. Plans deposit $500. Rownley & Matheson, 1376 Hornby St., archts. CD 4/14.

HEAVY CONSTRUCTION

LOW BIDS AND CONSTRUCTION

▲ **Northern Constr. Co. & J. W. Stewart Ltd.**, 1304 Hornby St., Vancouver, B. C., CA, **$1,619,444** Stage 1, hydro-electric generating station at Ladore Falls, tunnel and penstock to carry water 2,000 ft. to powerhouse, Campbell River, BRITISH COLUMBIA, B. C. Power Comn., P. O. Box 500, Victoria, B. C. Bids Mar. 31, awarded May 6. CD 4/27, under LB.

ALASKA

HEAVY CONSTRUCTION

LOW BIDS AND CONTRACTS

▲ † **Morrison-Knudsen Co. Inc.**, 319 Broadway, Boise, Idaho, LB **$1,934,810,** est. $1,472,505, constr. and rehabilitation utilidors, Eielson Air Force Base, Inv. 55-82, ALASKA. U. S. Eng., Anchorage, Alaska. Bids May 13. CD 5/6.

LATIN AMERICA

HEAVY CONSTRUCTION

LOW BIDS AND CONTRACTS

▲ **Brillembourgy Villegas Asociados, C. A., S. J. Groves & Sons of Venezuela, Inc.** (S. J. Groves & Son, 500 Wesley Temple Bldg., Minneapolis, Minn.) and **Constructora Nacional de Tuneles y Carreteras, S. A.** Caracas, Venezuela. CA. Est. **$13,200,000.** Rio Guarico Dam, Sects. B and C, VENEZUELA, Ministry of P. Wks., Caracas, Venezuela. Bids Mar. 7. CD 2/25.

BUILDINGS

LOW BIDS AND CONTRACTS

▲ **Mexico** — PLANT — Bids Asked — Industria Nacional Quimico Farmaceutica, S. A. de C. V., Atenas 40, Mexico D. F. fertilizer plant to produce 2,000 tons annually Benzinehexachloride and DDT and 40 tons per day of liquite chlorine. Site for plant not selected. CD 4/8.

AMERICANS ABROAD

BUILDINGS

LOW BIDS AND CONTRACTS

▲ **McGraw-Hydrocarbon, Inc.**, 51 E. 42 St., New York, N. Y., CA **$25,000,000.** design and construct 85,000 ton yearly chemical fertilizer PLANT, KOREA. Ministry of Commerce & Industry, Republic of Korea, Seoul. CD 9/25/53.

Proposal Advertisements see pp. 150 to 153

30 mph "C" hauls shovel rock

Chattanooga Stone Products used this "C" with rear-dump body to haul shovel-loaded limestone to their plant near Chattanooga, Tennessee. Rig's 14'4" turn radius speeded positioning at both shovel and hopper. All-steel body effectively withstood load, shocks.

with 22-ton rear-dump

Here's just *one* profitable use for versatile, 208 hp LeTourneau-Westinghouse C Tournapull prime-mover. Coupled to 22-ton rear-dump trailing unit, this 30 mph prime-mover becomes a big-production hauler. Operator takes it through its cycle at top speed, with complete safety, because it has 3763 sq. in. of braking surface — *more on one wheel than most haulers have on all four.* Holding action of powerful 4-wheel, disc-type air brakes, plus *front-wheel drive,* let it back safely to edge of bank, dump load clear to save dozer clean-up. Simple electric hoist (no troublesome hydraulics) tips body to vertical position. Smooth, clean, streamlined bowl clears loads instantly. Big 10'4" x 10'10" top opening speeds loading from shovel, dragline, or loader . . . reduces spillage. And, when you have no shovel work, money-saving interchangeability with scraper *doubles* Tournapull's earning capacity. For example . . .

. . . converts to move scraper dirt

with 16-yd. scraper

For less than 25% of the cost of the original unit, the rear-dump body interchanges with a LeTourneau-Westinghouse electric-control scraper. All you need is the scraper body — wheels, tires, brakes, and controls can be switched. This, of course, substantially reduces the cost of unit interchangeability. Big 21.00 x 25 tires, all-around, assure ample flotation in mud. Constant-pull, power-transfer differential also reduces weather delays . . . gives positive traction on soft banks and slick grades. Thus, scraper and rear-dump keep your "C" prime-mover working and earning all year 'round. Other auxiliary hauled units — including a 16-yard Bottom-Dump, 20-ton Flat-Bed and 20-ton Crane — further save time and reduce equipment investment per job. This money-saving Tournapull package also is available in both *larger* and *smaller* sizes. Call or write us today for facts on performance . . . price . . . and delivery!

Tournapull—Trademark Reg. U.S. Pat. Off. RP-818-G-b

Central Penn Quarry & Stripping Co., Hazleton, Pennsylvania, coupled their "C" prime-movers to scrapers for slag removal at West Nantioke. Unit shown has sliding-gear transmission. Constant-mesh transmission with torque converter also is available.

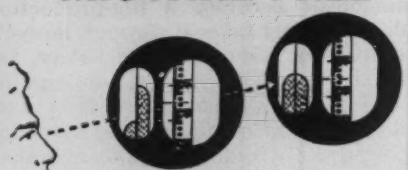
LeTourneau-Westinghouse Company

PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

SURVEYING NEWS

NEW LEVEL WITH DOUBLE BUBBLE IS "MISTAKE-FREE"



Adjustable double bubble always visible THROUGH SAME EYEPIECE as cross hairs and field.

- No need to turn telescope during leveling
- No need to look anywhere but through telescope to adjust level at any turn after initial set-up
- American type — erecting eyepiece, 4 leveling screws
- Unbelievably fast and accurate, yet simple-to-use. Economical!

Mail this coupon for details

FENNEL

INSTRUMENT CORP. OF AMERICA
11-27 44th Rd., Long Island City, N. Y.

Please send me Booklet A with information on Fennel . . .

☐ Double bubble ☐ Alidades
☐ Other levels ☐ Callimeters
☐ Transits ☐ Stands
☐ Combinations ☐ Tripods
☐ Theodolites ☐ Repair of my present instruments

NAME.....

ADDRESS.....

.....

UNIT PRICES

What Communities Across Nation Invest in Schools

From Cost Data in Bulletin of The American Institute of Architects and other sources

Elementary Schools

State	Date	Pupil stations	$/pupil station	$/sq ft
Arkansas	1953	450	$469	$9.60
	1953	184	513	13.95
California	1952	520	775	8.81
	1952	600	863	20.40
	1953	300	943	14.88
	1953	560	988	16.20
Colorado	1953	525	690	15.20
Connecticut	1950*	670	1,168	13.64
	1952*	300	996	14.10
	1952	640	907	16.19
	1953*	820	1,114	13.74
	1953*	700	947	14.85
	1954*	480	1,197	13.34
	1954*	580	1,313	14.11
	1955*	520	903	14.24
g	na*	400	534	11.52
h	na*	399	535	11.52
	na†	350	609	12.16
	na	740	1,426	18.15
Illinois	1952	200	697	9.69
	1952	600	648	12.71
	1952	500	714	12.78
	1952	240	1,085	15.00
	1953	510	621	10.61
	1953	500	1,258	12.30
	1953	420	844	13.39
	1953	400	1,869	16.37
	1954	150	873	10.00
	1954	270	862	14.10
	1954	90	1,906	17.85
	na	180	1,085	12.13
	na	500	832	13.64
Kansas	1953	220	869	12.57
	1954	220	856	11.68
	1954	120	612	12.71
Kentucky	1954	360	263	7.29
	1954	300	316	7.30
	1954	630	659	8.21
Michigan	1950*	536	916	11.40
	1950*	944	1,033	14.75
	1951*	632	863	14.55
	1952*	752	1,037	17.00
a(area)	1953	800	794	13.65
a	1954*	858	545	11.40
a	1954*	1,050	940	15.75
	1954*	752	1,056	16.01
	1954*	752	1,155	17.04
	1954	500	1,165	21.80
a	1954*	455	1,165	22.51
a	1954*	595	1,089	22.12
Minnesota b	1951	795	1,076	14.47
	1953	210	1,107	14.30
	1954	540	991	13.25
Missouri d	1954	800	1,379	10.64
New Mexico	na	480	379	11.51
North Carolina	1953	450	792	10.90
	na	380	591	10.38
New York	1951	600	1,804	17.30
	1952*	700	859	13.26
	1952	780	1,423	15.90
	1952	560	1,308	19.33
	1952	750	2,040	23.10
	1953	384	1,567	15.72
	1953	270	1,041	18.67
	1953	600	1,502	19.60
	1954†	750	1,098	13.97
	1954	620	1,021	14.90
	1954*	490	1,289	15.13
	1954*	490	1,440	15.64
Ohio c	1952*	650	883*	17.50
j c	1953*	650	760	15.08
j c	1953*	650	789	15.65
c	1954*	360	755	14.35
c	1955*	290	764	15.97
Oregon	1952	300	1,427	12.18
	1953	450	608	8.39
	1953	240	773	9.77
	1953	180	862	10.14
	1954	540	798	9.97
	1954	300	665	11.00
Pennsylvania	1953	360	1,176	16.93
	1954*	450	913/	12.83
	1954*	450	954/	13.15
South Carolina	1953	700	567	9.35
South Dakota	1953	200	1,132	14.38
Texas	1953	200	1,305	13.88
Utah	1954	200	1,034	12.90
Virginia	1952	420	649	10.10
	1954	660	934	12.64
West Virginia	1954	475	608	16.86
Wisconsin	1954	320	674	11.50
Wyoming	1953	400	677	11.78

a Detroit area b Minneapolis c Cleveland d St. Louis e incl wrecking old hs f not incl rock exc or arch finish g new but identical to h, an addn i identical to j * non-AIA data † 2 identical schools

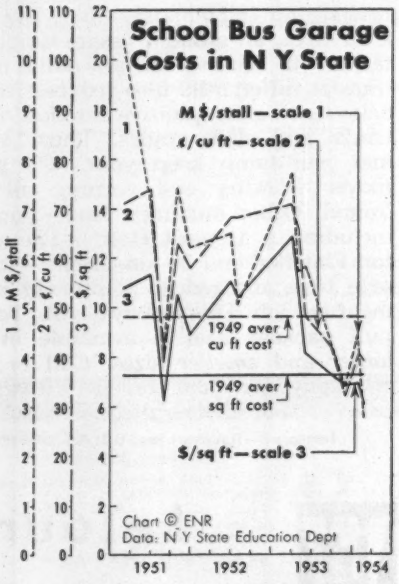
Secondary Schools, Jr or Sr High

State	Date	Pupil stations	$/pupil station	$/sq ft
California	1951	1,000	$1,007	$16.90
	1953	1,500	1,185	14.32
Colorado	1953	180	1,239	12.90
	1953	360	835	14.46
Connecticut	1951	550	1,729	17.84
Iowa	1951	600	1,876	10.49
Illinois	1950	900	2,007	14.10
	1952	1,000	1,417	16.40
	1953	600	1,877	15.63
Kansas	1953	600	1,397	13.00
	1954	450	1,176	11.48
Michigan	1954	800	1,737	14.75
a	1954*	390	1,400	13.20
a	1954*	535	1,065	12.25
Minnesota	1953	1,800	1,433	13.81
Montana	1954	900	1,652	14.32
	1954	1,000	960	12.97
New Hampshire	1952	200	1,699	12.70
New York	na	435	1,472	11.24
	1951	600	2,258	20.17
	1953	600	1,759	16.45
	1953	600	2,324	17.79
Ohio	1954	400	845	12.00
Pennsylvania	1953	900	2,411	19.47
	1954	800	2,530	16.70
South Carolina	1953	700	688	7.52
	1953	750	692	8.35
Virginia	1951	600	1,425	14.00
	1953	1,500	1,996	16.96
Wisconsin	1954	1,500	1,941	9.88

School Bus Garage Cost

N Y State Education Dept, Div of Bldgs & Grounds

Date	No of Garages	Low	Medium	High
		Cost per Stall		
1951	6	$4,150	$6,675	$10,400
1952	3	5,050	6,000	7,050
1953	6	3,420	5,025	7,700
1954	2	2,740	.....	4,460
		Cost per Cubic Foot		
1949	7	$0.30	$0.50	$0.58
1951	6	0.39	0.63	0.74
1952	3	0.54	0.68	0.83
1953	6	0.32	0.45	0.71
1954	2	0.39	....	0.41
		Cost per Square Foot		
1949	7	$5.00	$7.30	$8.90
1951	6	6.33	10.33	11.30
1952	3	9.20	10.35	12.94
1953	6	6.85	7.79	12.85
1954	2	6.10	.....	6.94



HERE'S HOW TO AVOID BEARING REPLACEMENT HEADACHES

says **HY WHEELER,**
the sage of the socket wrench:

1. *Always* replace a Hyatt with another identical Hyatt.

2. Make sure shaft and housing bore seats are clean and smooth.

3. When pressing on inner races start bearings on shaft with rounded corner radius of race going first.

4. Direct the driving pressure straight and square, directly through race to be press fitted. Never hammer directly on races or rollers, and never use a wooden or soft metal mallet (chips or splinters may get into the bearing).

5. Use a lot of sharp quick taps instead of a few heavy ones; have straight square ends on driving accessories and fixtures, and drive races solidly up against shoulder of shaft or housing.

6. *Keep your hands and tools clean;* don't remove bearings from package until you're ready to use 'em—and most important of all, *be sure the package is the blue and yellow Hyatt box!* Remember, when it comes to *quality,*

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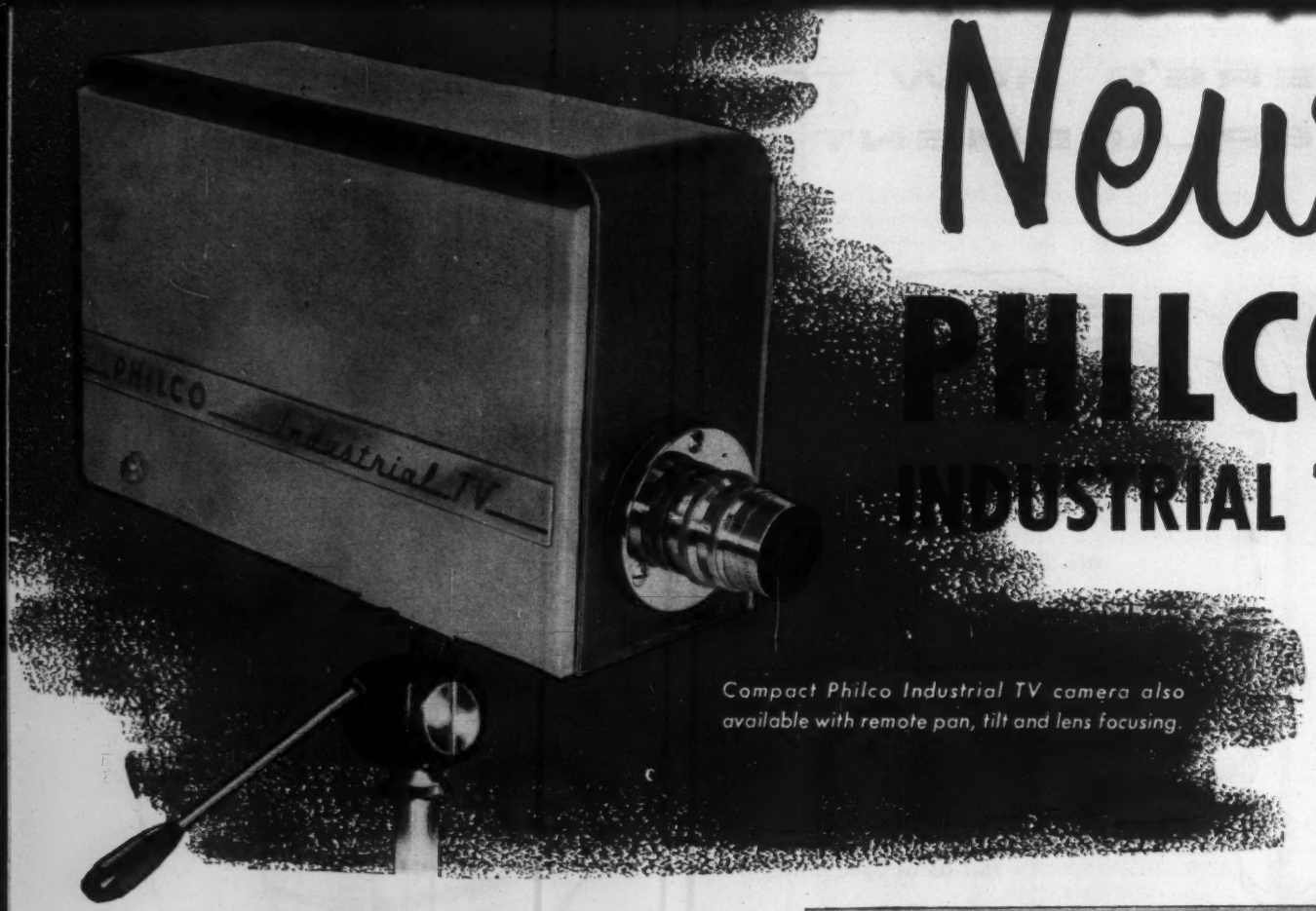

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- ✔ *Operation at extremely low light levels*
- ✔ *Complete remote control of camera*

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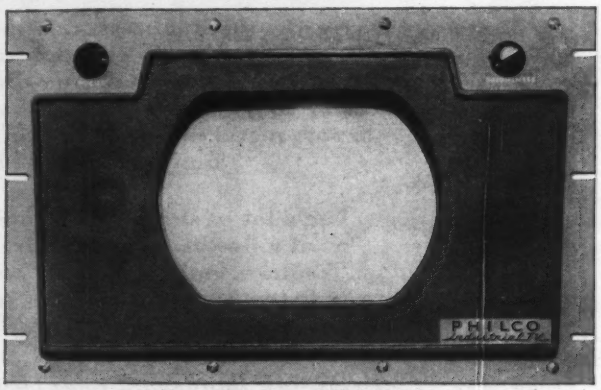

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Building Cost and Price Roundup

Indexes, 1913 = 100

		1954	1955				
Weighted Cost Indexes		average	Jan.	Feb.	Mar.	Apr.	May
ENR Construction Cost	1913 = 100	628	644	645	646	647	**653**
ENR Building Cost	1913 = 100	446	458	459	460	461	**463**
Assoc. General Contractors	1913 = 100	426	432	432	432	**434**	...
American Appraisal*	1913 = 100	592	598	599	**600**	...	...
Marshall & Stevens	1926 = 100	459	...	...	**470**	...	...
Weighted Price Indexes**							
Boeckh, comm'l & mfg	1926–29 = 100	450	455	455	**456**	...	...
Smith, Hinchman & Grylls	1926 = 100	500	505	509	509	**514**	...
Contractor Price Indexes							
Aberthaw***	1914 = 100	394	...	...	**396**	...	...
Austin	1926 = 100	352	...	...	**357**	...	...
Fruin Colnon	1926 = 100	469	475	475	475	**477**	...
Fuller	1913 = 100	450	456	...	...	**456**	...
Turner	1939 = 100	489	487	...	...	**493**	...

* Adjusted for estimated productivity.
** Includes overhead, profit, adjusted for estimated productivity.
*** Indexes shown are based on 1914 = 100.

Indexes Reflect Cost Rise

As ENR has already emphasized (May 19, p. 21), construction costs are advancing faster this year than in 1954. Indications are that this trend will continue for at least several months.

In addition to the ENR Building and Construction Cost Indexes, two other cost indexes that weigh materials prices and wage rates confirm the trend (table, above). The AGC index, however, has not gone up as fast this spring as it did during the same period in 1954.

• **Price indexes**—The table also shows how this cost rise is reflected in indexes that measure the prices building contractors charge for their work. They all show increases. However, each of the price indexes are rising at different rates.

For instance, three of the five contractor price indexes have climbed less, percentage-wise, than the ENR Building Cost Index. In these cases the inference is that higher productivity and perhaps lower profit margins are keeping the rise in the prices which contractors charge below what they pay for materials and labor.

The same applies to the Boeckh weighted price index for commercial and factory buildings, which in addition to materials and labor costs, allows for contractor overhead, profit, and estimates of changes in productivity. This index, therefore, is measuring the same factors as the contractor price indexes. The Boeckh index increased about half the percentage rise in the ENR Building Cost Index, and a little more than the three contractor price indexes.

However, the Austin and Turner contractor price indexes are up more than the ENR index. And this is also true of the Smith, Hinchman & Grylls weighted price index, which like the Boeckh index is measuring just about the same thing as contractor prices.

• **Split**—So there is a split in what the weighted price indexes and contractor price indexes show in relation to rising costs. Some of them are up more than costs; a slight majority is up less. Where the price indexes are up less than costs, better productivity is probably more of a factor so far than increased competition.

A change may be coming in productivity. This year's construction boom is tightening supplies of key building materials. That could reverse the recent trend to higher productivity. Add to this the outlook for bigger wage increases this year, and the current upswing in materials prices. It indicates that building costs and prices, already at an all-time high, will keep going up.

Toll Roads Make News Again For First Time This Year

After many months of inaction, toll roads are in the news again this week. The Florida State Turnpike Authority will receive bids till June 7 on its $74-million issue of revenue bonds for the 103-mi pike between Hollywood and Fort Pierce. On June 14, the Texas Turnpike Authority will sell $58.5 million of revenue bonds for the 30-mi toll road between downtown Dallas and downtown Fort Worth.

Engineers expect the Dallas-Fort Worth Turnpike to be open by July 1, 1957. They also figure it will save drivers 26 min. in travel time between the two major Texas cities. The State Highway Department is building extensive free expressway connections.

Though six months ago it seemed that several big pike projects would soon be coming up, no new toll roads have been financed this year, and no others are definitely scheduled now.

The $400-million Illinois toll-road offering apparently will be blocked several months more by litigation. A feasibility report on the Richmond-Petersburg turnpike project is expected June 1. There are several projects which might be financed this year—or might be indefinitely postponed. They are:

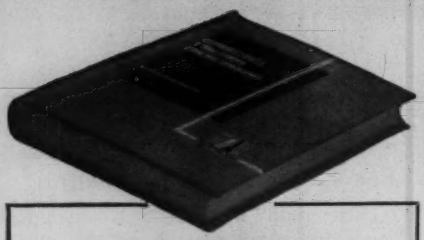
Michigan North-South Turnpike ($194 million)
Washington State Toll Road ($227 million)
South Louisiana Turnpike ($100 million)
Indiana North-South Turnpike ($178 million)
Ohio Turnpike No. 2 ($465 million)

Conditions in the bond market are not as helpful to marketing of turnpike issues as they were last year. Money is definitely tighter now. However, a turnpike bond issue yielding from 3.5% to 4.0% of tax-exempt interest would undoubtedly attract buyers, provided the engineers' reports showed a comfortable cushion of earnings available for interest and amortization. Marginal toll-road projects are not likely to arouse much interest in Wall Street.

Private A-Plant Expenditures To Reach $7½ Billion by 1965

By 1965, more than $7½ billion will have been spent by private companies on reactor construction in this country. That is one of the conclusions of a year-long study just completed by

(Continued on page 146)



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Thorough treatment of public water supply, also including private and industrial supplies. Discusses all phases of the subject necessary to complete waterworks planning and design—finanical and administrative principles, estimating usage, computing surface runoff and ground-water supplies, hydraulics of flow, materials and their use, pumping stations, etc. Includes extensive treatment of water purification. **By H. E. Babbitt, San. Eng., and J. J. Doland, Prof. of Hydraulic Eng., Univ. of Ill. 5th Ed. 675 pp., 257 illus., $8.50**

ESTIMATING CONSTRUCTION COSTS

Here are the practical considerations you need to know to make accurate estimates on engineering projects—the understandable methods and helpful data you need for realistic, sound estimating. Each major type of construction is covered in detail not only on materials, labor, and equipment, but on overhead and profit as well. Over 100 time-saving tables help you make speedy, accurate estimates. **By R. L. Peurifoy, Prof. of Civil Engineering A&M College of Texas. 350 pp., 60 illus., $8.00**

DIESEL ENGINE OPERATION AND MAINTENANCE

What makes diesel engines run—and what it takes to keep them running smoothly—is disclosed in this practical treatment. Develops understanding of principles behind workings of a diesel engine, plus familiarity with design and function of its main components. Includes maintenance methods . . . how and when to overhaul diesels . . . simple ways to make repairs. **By V. L. Maleev, Thermo. Eng'r., North American Aviation Corp. 504 pp., 357 illus., $8.50**

HANDBOOK OF HYDRAULICS

Here in compact, accessible form are the many tables and other reference data required by the practicing hydraulics engineer who wants to speed his computations without losing accuracy. Covers every phase of common practice as well as many special problems. Condenses and simplifies rules and formulas. **Fourth Edition** includes information on fluids other than water, orifices and sluice gates, weirs, pipes, uniform and non-uniform flow in open channels, etc. **By H. W. King. Revised by E. F. Brater, Prof. of Hyd. Engrng. Univ. of Mich. Fourth Edition. 567 pp., 133 tables, 165 illus., $8.00**

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BUSINESS AND FINANCE

Atomic Industrial Forum, Inc. The forum is a nonprofit membership association of nearly 300 industrial, research and educational organizations and over 800 individuals active in peacetime development of atomic energy.

The study estimates that between 3,000,000 and 5,000,000 kw of electrical generating capacity may have to be built and operated at a loss or on a breakeven basis before reactor-generated power will become competitive with conventional power. The forum's guess is that large reactor power plants will become economic sometime after 1962.

By 1963, sales of components for reactor plants are expected to be at a volume of about $700 million a year. Up to that time and perhaps until about 1965, the largest market for reactor equipment will be in propulsion reactors for submarines and perhaps other naval vessels, and in aircraft.

By 1965, the government atomic program along with private programs by U. S. companies will call for a total of 30,000 to 40,000 scientists and engineers—about double the number in both categories that are employed in the atomic field today.

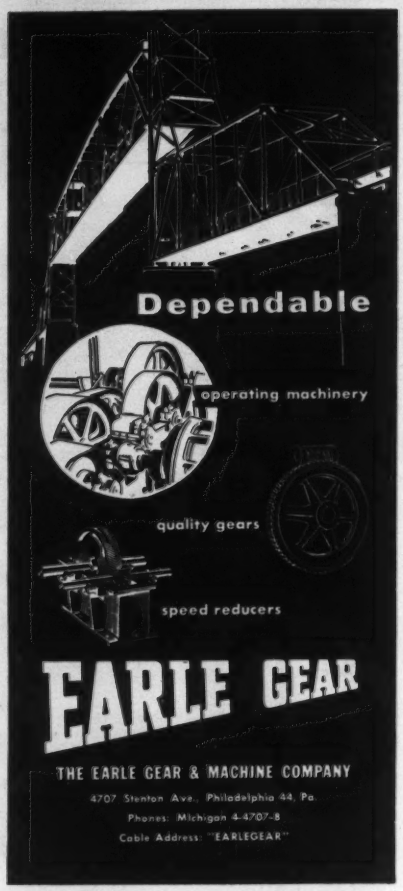
The report gives detailed estimates on dollar volume of major equipment units, on fuel processing and fuel element fabrication, and on waste treatment and storage. It is available at the forum's office at 260 Madison Ave., New York City 16.

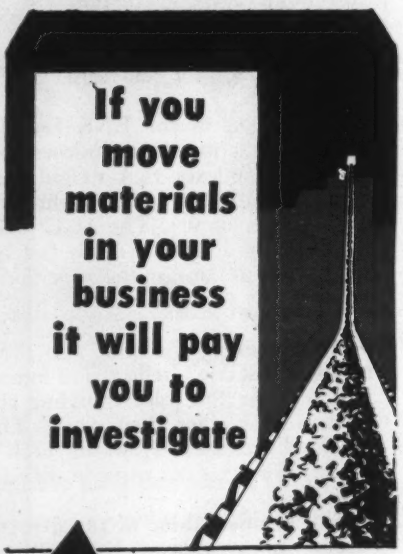
Business Briefs . . .

• **General Motors Corp.** has taken options on more than 400 acres of land just west of Mansfield, Ohio, for an $80-million plant. The new plant, to be completed in about three years, reportedly will stamp out auto body sections to be shipped to assembly plants.

• **Financier Floyd Odlum** has proposed construction of two uranium mills in Utah, to cost from $15 million to $25 million. Hidden Splendor Mining Co., a subsidiary of Odlum's Atlas Corp. is negotiating with the AEC for erection of a mill, probably near Green River. Federal Uranium Corp., also controlled by Odlum interests, is planning another mill.

• **Thew Shovel Co.** has acquired plant and inventory of the former Byers Machine Co., of Ravenna, Ohio, for about $900,000. A new subsidiary, Byers Machine, Inc., has been formed to run the Ravenna plant.





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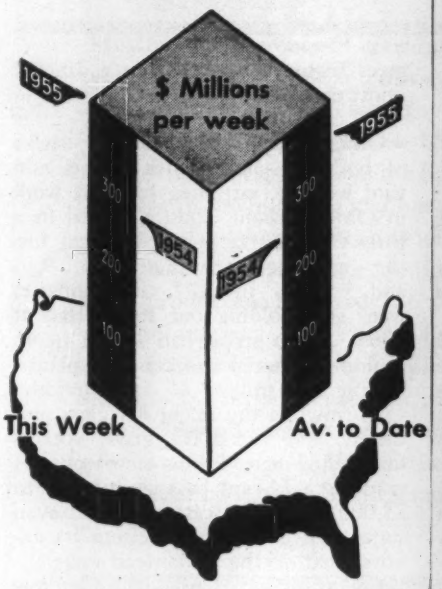
Activity This Week

As reported to ENR
(In millions of dollars)



Amount of contracts let

	This Week	Cumulative 21 wks 1955	1954	% chge
Federal	$29.3	$705.7	$413.0	+71
State and municipal	83.8	2,037.2	1,498.4	+13
Total public	113.1	2,742.9	2,211.4	+24
Total private	289.6	4,799.7	3,131.5	+53
U. S. Total	$402.7	$7,542.6	$5,342.9	+41

Contracts by type of work

Waterworks	$4.5	$103.5	$97.6	+6
Sewerage	6.3	159.0	151.3	+5
Bridges	5.5	182.0	149.4	+22
Highways	38.0	792.9	650.9	+22
Earthwork, Waterways	5.0	206.1	113.2	+82
Buildings:				
Public, excl. hsg.	27.2	665.0	658.5	+1
Housg., public	2.8	114.2	73.9	+55
Housg., private	115.9	2,792.3	1,730.8	+61
Commercial	27.8	655.0	503.6	+30
Industrial	59.7	1,033.9	777.1	+33
Unclassified	110.0	838.7	436.6	+92
Total	$402.7	$7,542.6	$5,342.9	+41

NOTE: Minimum size projects included are: Waterworks and waterways, $44,000; other public works, $73,000; industrial buildings, $93,000; other buildings, $344,000.

New capital for construction

(millions of dollars)

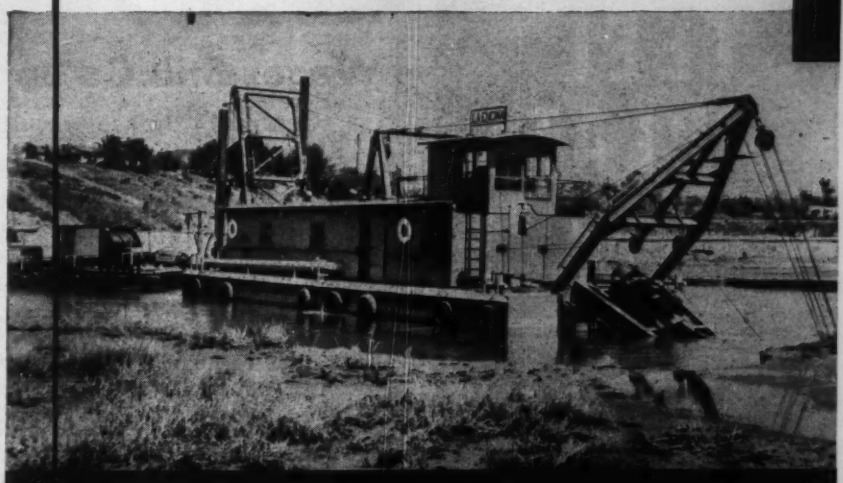
	Week of May 19 1955	Cumulative 20 wks 1955	% chge '54-'55
Corporate securities	$54.1	$1,311.1	+10
State and municipal:			
All except housing	84.6	1,544.9	−31
Housing	...	46.2	+8
Federal loans	0.8	39.1	−20
Federal aid	...	95.0	+73
Total non-federal	$139.5	$3,036.2	−15
Federal appropriations:			
In U. S.	$...	$59.2	+6
Outside U. S.	...	...	−100
Total new capital	$139.5	$3,075.4	−15

ENR cost and volume indexes, 1955

		Base years = 100 1913	1926	1949
Construction cost	5/19	654.02	314.39	137.11
	4/28†	653.26	314.02	136.95
Building cost	5/19	463.59	250.60	131.78
	4/28†	462.55	260.04	131.48
Volume	Apr.	609	248	176
	Mar.	691	281	200

† Official monthly index for May

LA ENCINA . . . her job:



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The project is part of the multi-million dollar expansion program of San Diego Gas and Electric Company at Encino, California.

The same dredge will be used for maintenance of the tidal basin, removing an estimated 50,000 cu. yds. of sand and silt accumulation each year.

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Wages Still Go up

Contract talks, results hit firm, steady pace

New contracts with the building trades in collective bargaining negotiations across the nation continued last week to push construction wages up a few more notches.

Increases ranging from 10 to 12.5 cents an hour were common and the trend toward two-year contracts was holding its own. Truck drivers in St. Louis, striking against concrete plants and material dealers, continued to cripple construction. And rising building costs (ENR May 19, p. 21) got another shot in the arm with a new wage increase in the flat glass industry, although action on a guaranteed annual wage was tabled until next year.

Here are some of the highlights:

• **Des Moines, Iowa**—Teamsters and electricians—last of the building trades to settle—have signed new contracts giving electricians a 5-cent boost in basic rates plus a 7.5-cent employer contribution toward a one-week paid vacation. Teamsters won a 10-cent increase plus 10 cents more "per yard of material hauled." Twelve other trades previously settled for wage hikes ranging from 10 to 12.5 cents.

• **Akron, Ohio**—Two months of negotiations between the AGC and 17 building trades, bargaining for the first time as a unit and representing 8,500 workers, ended in a two-year contract, averting a strike and granting an 8-cent wage increase each year—a half cent more than operating engineers had won earlier on their own.

• **San Francisco**—Carpenters in 42 northern California counties settled for two-year contracts granting a 12.5-cent increase now and 10 cents more next year. Millwrights and foremen will get 20 and 33 cents, respectively, above the journeymen's scale.

• **Here and there**—Operating engineers in western Washington won a 12-cent wage boost plus 50 cents more a day in travel pay beyond the 25-mi zone. A two-year contract gives carpenters on building construction in Utica, N. Y., 12.5 cents more each year but leaves rates for one and two-family homes the same. Bricklayers and masons in Pueblo, Colo., settled for 12.5 cents on a one-year contract. A two-year settlement in Minneapolis gives highway truck drivers a 10-cent boost each year.

• **Other sectors**—A week-old strike of building supply truck drivers and yard workers, crippling highway work in Ohio's Lorain County, ended in a three-year contract—first in local history—granting yearly increases of 9, 6 and 5 cents. In St. Louis, teamsters were still holding out for a 10-cent boost. Their strike had spread to 46 building material and concrete plants, halting $78 million of construction.

Meanwhile the major flat glass producers and the CIO glass workers union had agreed to a new contract granting a 14-cent package increase to 23,000 employes scattered over seven states, but postponing decision for another year on the guaranteed wage.

Out of negotiations now under way in metropolitan New York has come a new two-year contract with the mason tenders. Among the first to be signed this year, it covers 10 locals, leaves fringe benefits the same, adds 10 cents to the basic rate each year, and extends the expiration date one month to make it the same as most other trades.

In Fort Wayne, Ind., bricklayers signed a one-year pact granting a 10-cent increase. Youngstown, Ohio, carpenters and the Mahoning Valley General Contractors Assn. agreed to a two-year contract with a 12.5-cent increase now and 5 cents more on Nov. 1, May 1, and Oct. 1.

• **No progress**—Last week the situation grew tense in Cleveland as the Building Trades Council said "no" to the 15-cent (7.5 and 7.5), two-year package already accepted by four crafts. It wants 10 and 10 on a two-year contract or 12.5 on a one-year settlement. Painters threaten a strike to get it.

Arizona contractors, who initially hoped to hold the line on wages, still faced demands running as high as 87.5 cents plus fringe benefits. They offered a 2% per year increase to 16,000 workers across the state for a five-year contract. With no settlement in sight, they upped the offer again last week to boosts ranging from 5 to 20 cents.

University Will Honor Wisconsin Labor Leader

One of the Wisconsin leaders of the American Federation of Labor will be honored by the University of Wisconsin at commencement exercises in June. The honorary degree of doctor of laws will be conferred upon

(*Continued on page* 150)

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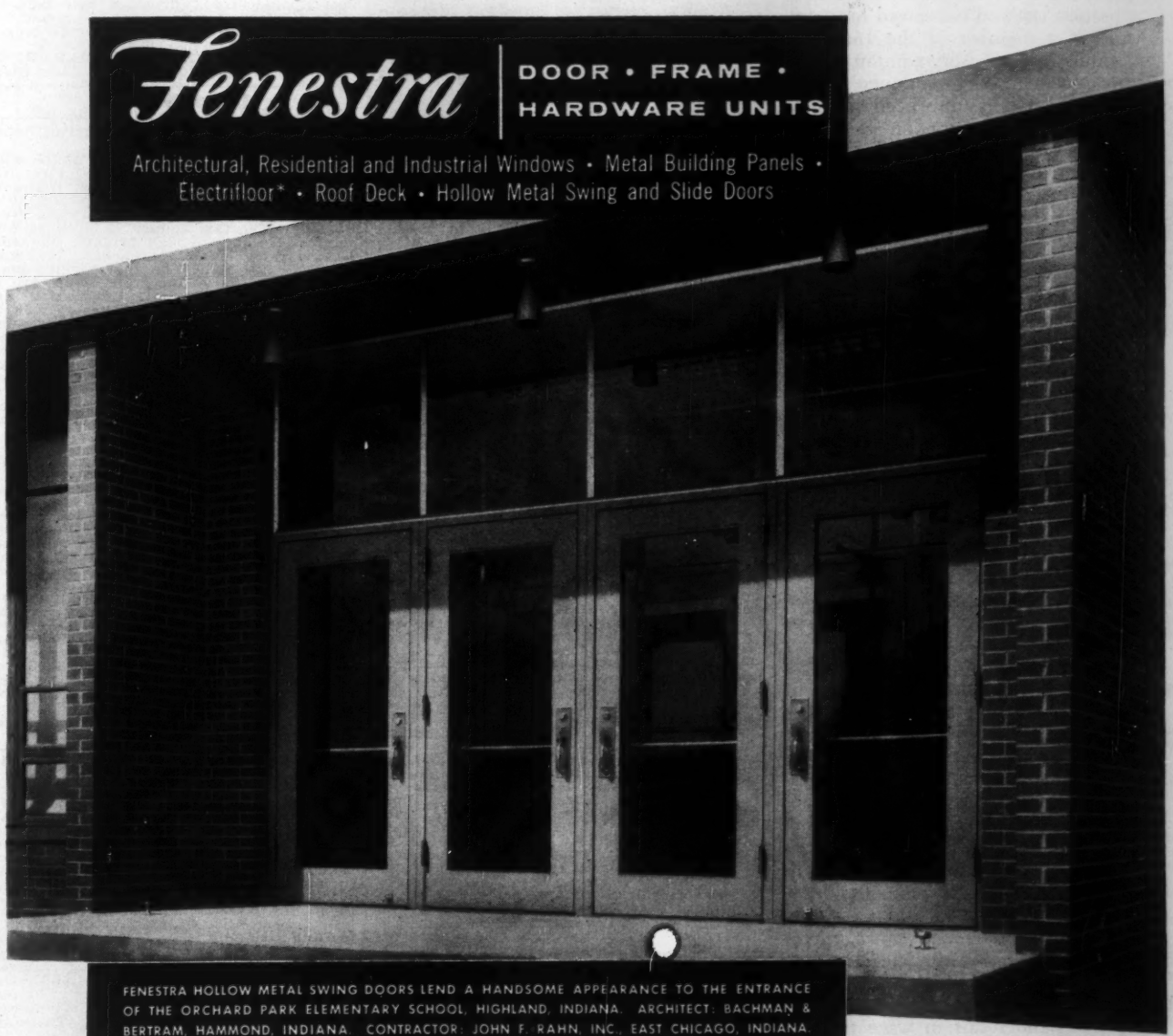
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Jacob F. Friedrick, an AFL machinist now general secretary of the Milwaukee Federated Trades Council.

A champion of cooperative labor-management relations and a pioneer in the field of education for workers, Friedrick served as AFL regional director in Wisconsin for 10 years before being appointed to his present post in 1951.

During his 42 years with the union, he has been closely associated with the Milwaukee Labor College which he helped establish in 1921 and with the University of Wisconsin School for Workers on whose advisory board he served for the last 30 years. At the present time, Friedrick is a member of the Wisconsin Advisory Committee on Veterans' Education.

Friedrick helped in the drafting of Wisconsin's first unemployment compensation law and has served for many years as a member of the Industrial Commission's advisory committees on unemployment and workmen's compensation. He has also been active in sewerage development on both the city and county levels and has served for over 30 years as a member of the Sewerage Commission of Milwaukee, of which he's been chairman since 1932.

Labor Briefs . . .

• **Lose your bonus?**—Two foremen employed by a subcontractor on a new state bridge near Everett, Wash., were awarded $15,000 each in a lawsuit against the sub for unpaid bonuses. They claimed they'd been promised bonuses for savings they effected and that they were fired before completion because work was ahead of schedule. The sub had received $149,000 for the job.

• **Merger**—Following the pattern set in the United States, Canadian labor leaders are paving the way for merger of the Trades and Labor Congress (AFL) and the Canadian Congress of Labor (CIO) into a million-member unit to be called the Canadian Labor Congress. The newly drafted merger agreements will come up for ratification later this year.

• **Return to fold**—Some 7,000 Alameda County, Calif., carpenters affiliated with locals that bolted the county AFL Building and Construction Trades Council 11 years ago have voted to rejoin the council. The Bay Counties District Council of Carpenters, however, will continue to represent the locals in wage negotiations with the AGC.

OFFICIAL PROPOSALS

APPEAR HERE EACH THURSDAY. PROPOSAL ADVERTISEMENTS ACCEPTED UP TO 10:30 A.M. FRIDAY FOR THE ISSUE DATED THE FOLLOWING THURSDAY.

Bids: June 3, 1955

State of New Jersey
State Highway Department
Trenton

NOTICE IS HEREBY GIVEN that sealed bids will be received by the State Highway Commissioner for:

ROUTE 36, SECTION 4A

Route 36, Section 4A, Broadway to Oceanport Avenue, Paving and Joline Avenue Connection, Oceanport Avenue to Branchport Avenue, Borough of West Long Branch and City of Long Branch, Monmouth County. Length 1.068 miles. The principal items of work are:

Estimated:

17,276	cu. yds. Roadway Excavation-Earth
4,156	cu. yds. Subbase
3,390	sq. yds. Pen. Mac. Surface, Hot Application, 3" thick
19,172	sq. yds. Macadam Base Course, 6" thick
770	tons Pavement Type MA-BC-2, Bottom Course, Var. thickness
8,774	sq. yds. Pavement Type MA-BC-2, Top Course, 1½" thick
20,392	sq. yds. Pavement Type MA-BC-1, 2" thick
115	lin. ft. Railroad Crossing Pavement
2,840	lin. ft. Reinforced Concrete Culvert Pipe
165	lin. ft. Corrugated Metal Culvert Pipe
3	Inlets
2,400	lin. ft. Concrete Curb
100	lin. ft. 6'-4" x 4'-9" Corrugated Metal Plate Pipe Arch

Bids for the above will be received at the office of the State Highway Department, in the CAFETERIA, State Highway Office Building, 1035 Parkway Ave., Trenton, N. J., on Friday, June 3, 1955, at NINE o'clock (9:00 A.M.—EASTERN STANDARD TIME), TEN o'clock (10:00 A.M.—DAYLIGHT SAVING TIME), and will be opened and read immediately thereafter.

The receipt and opening of bids is subject to the proper qualification of the bidder in accordance with the provisions of the prequalification law and the regulations adopted by the State Highway Commissioners. Bidders must also submit a revised financial statement and statement of plan and equipment with their bid.

Drawings, specifications and form of bid, contract and bond for the proposed work are on file in the office of the State Highway Department, Trenton, N. J., and may be inspected by prospective bidders during office hours. Plans and supplementary specifications will be furnished upon payment of a fee of FIFTEEN DOLLARS ($15.00) for each set upon application to A. Lee Grover, Chief Clerk, State Highway Department, Room 139, State Highway Office Building, 1035 Parkway Avenue, Trenton, N. J., with a check drawn to the order of the State Highway Department. A charge of $5.00 will be made for supplementary specifications unaccompanied by construction plans. Bids must be made upon the standard proposal forms in the manner designated in the standard State Highway specifications and must be enclosed in sealed special addressed envelopes bearing the name and address of the bidder and work bid upon on the outside, and must be accompanied by the following documents: (1) a certified check drawn to the order of the Treasurer of the State of New Jersey for not less than ten percent (10%) of the amount of the bid, provided that the said certified check shall not be less than $500.00 nor more than $20,000.00; (2) a proposal bond for a sum of not less than fifty percent (50%) of the total price bid for the project; (3) a financial statement (Part 1 of the Prequalification Questionnaire); (4) a plan and equipment statement (Part 3 of the Prequalification Questionnaire); and (5) a Non-collusion Affidavit; and must be delivered at the above place on or before the hour named. Copies of the standard proposal forms and special addressed envelopes will be furnished on application. Bids not enclosed in sealed special addressed envelopes will be considered informal and will not be opened. The right is reserved to reject any or all bids.

Signed:

STATE HIGHWAY DEPARTMENT
A. Lee Grover, Chief Clerk

U. S. Government

Department of Commerce, Bureau of Public Roads, May 11, 1955.

SEALED BIDS will be received at the office of the Bureau of Public Roads, First National Bank Building, Florence, Alabama, until 10:00 A.M., C.S.T., JUNE 10, 1955, for Project 3H4, 6, 7, 8, 9, 10, Natchez Trace Parkway, Choctaw County, Mississippi. Five reinforced concrete slab bridges, one steel I-beam bridge, and approaches. Aggregate length: 0.535 mile. The approximate quantities of the more important items are as follows: 50,880 cu. yd. Excavation and Borow, 2,724 cu. yd. Concrete, 451,000 lb. Reinforcing Steel, 153,840 lb. Structural Steel, and 11,950 lin. ft. Treated Timber Piles. Minimum wage rates have been fixed as required by law. Plans, specifications, and proposal forms are available upon request at the address given above, or Bureau of Public Roads, 1440 Columbia Pike, Arlington 4, Virginia. H. J. Spelman, Division Engineer.

Department of Commerce, Bureau of Public Roads, May 12, 1955. SEALED BIDS will be received at the office of the Buerau of Public Roads, Gatlinburg, Tennessee, until 1:30 p.m., E.S.T., JUNE 10, 1955, for Project 2U5-V6, Blue Ridge Parkway, Haywood and Transylvania Counties, North Carolina. 11.365 miles slope stabilization, bituminous surface treatment and other work from Wagon Road Gap to Beech Gap. The approximate quantities of the more important items are as follows: 12,000 cu. yd. Excavation, 55,000 gal. Tar, 5,900 tons Aggregate for Surfacing, 110,000 gal. Asphalt and 2,700 units of Seeding. Minimum wage rates have been fixed as required by law. Plans, specifications and proposal forms are available upon request at the office of the Division Engineer, 1440 Columbia Pike, Arlington, Virginia, or at the address given above. H. J. Spelman, Division Engineer.

DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Specifications No. DC-4431) will be received at Palisades, Idaho until June 23, 1955, for furnishing labor and materials for Palisades-Goshen 115-kilovolt Transmission Lines, Palisades Project, Idaho. Location between Palisades Dam, Idaho and Goshen, Idaho. Principal items are 458 structures, furnishing and constructing wood pole structures of various types; 1,434 assemblies, furnishing, assembling and attaching insulator assemblies; 60 miles of line, furnishing and stringing three 556,500 circular mil ACSR conductors; 60 miles of line, furnishing and stringing two ⅝-inch galvanized-steel, overhead ground wires; and other work. Completion time 400 days. For particulars, address Bureau of Reclamation, P. O. Box 937, Boise, Idaho; Palisades, Idaho; or Building 53, Denver Federal Center, Denver 2, Colorado. W. A. Dexheimer, Commissioner.

OFFICIAL PROPOSALS

Bids: July 5, 1955

City of Richmond, Virginia

NOTICE TO BIDDERS

Sealed Proposals will be received at the office of the City Purchasing Agent, 4th floor, Mosque Building, Laurel and Main Streets, Richmond, Virginia, until but not later than 11 o'clock A.M., E.S.T. July 5, 1955, at which time they will be publicly opened and read aloud, for the following work which may be awarded in whole or in part:

Location: From and including a connection with the river crossing inlet chamber, to be built under another contract, at a location near the City Lock, along the northeast bank of the James River to the outlet of the existing Shockoe Creek System west of 17th Street in the City of Richmond, Virginia.

Type of Work: The work to be done is part of the Sewage Disposal Project, is entitled "Division B—Schockoe Creek Intercepting Sewer" and comprises the construction of approximately 3,300 linear feet of 96-inch reinforced concrete pipe sewer complete with all manholes, intercepting and overflow structures, and other structures as shown, specified and directed.

The Proposal must be submitted on the proposal forms included in the Contract Documents.

Each Proposal must be accompanied by a certified or cashier's check made payable to the City of Richmond, equal to 5% of the amount of the Proposal, or bid bond equal to 6% of the amount of the Proposal, or be covered by an annual bid bond in the amount of at least 6% of the Proposal.

The Proposal Guaranty is required as an evidence of good faith and as a guaranty that, if the Proposal of bidder is accepted, the bidder will enter into the formal written Contract and furnish satisfactory Performance Bond. Check will be forfeited or bid bond will become due and payable if the bidder whose Proposal is accepted fails to furnish the required Performance Bond, or fails to execute a formal written Contract. Check of successful bidder will be returned after the Contract is executed.

The Bureau of Purchases reserves the right to waive any informality in bids.

The Contract may be awarded by the Purchasing Agent to the lowest responsible bidder, who shall be determined in the manner provided by law and pursuant to the provisions of the City Charter.

The City may reject any or all bids and may award the Contract in the manner provided by law and pursuant to the provisions of the City Charter.

The unit prices bid will be carefully examined and compared with current values before recommending the award of the Contract. If in the opinion of the Director the unit prices submitted are substantially over or under accepted current values, it will be deemed sufficient reason to recommend the award of the Contract to another responsible bidder. In case of error in the extension of a price in the bid, the unit price shall govern.

Attention is directed to Chapter 7 of Title 54 of the Code of Virginia of 1950. The act requires all contractors and subcontractors bidding on any project where the cost of the undertaking of the bidder is $20,000.00 or more, to register with and obtain a certificate from the State Registration Board for Contractors. Bids from contractors not complying with this law will not be considered. Anyone bidding as a general contractor whose bid includes sub bids amounting separately to $20,000.00 or more is required to obtain evidence from such subcontractors that they have complied with the law.

Any contractor submitting a bid on this project amouting to $20,000.00 or more, must insert the following statement in his bid over his signature: "Registered as a contractor under Chapter 7 of Title 54 of the Code of Virginia of 1950. Certificate No. ....., 19...."

Unless otherwise specified herein, bidders must enclose with their Proposals, in a separate sealed envelope, complete information as to experience, equipment and financial condition on the form provided. Failure to submit this statement will constitute basis for rejection of the bid. Bidders who have previously been awarded contracts for portions of the Sewage Disposal Project will not be required to submit this statement.

The Proposal, Instructions to Bidders, Contract, Performance Bond, Instructions to the Contractor, Specifications, Plans, and other Contract Documents may be examined at the office of the Director of the Department of Public Works, 217 Governor Street, Richmond, Virginia, and at the office of Greeley and Hansen, Engineers, 220 South State Street, Chicago 4, Illinois. Copies of the Contract Documents may be obtained from the Director or the Engineers upon deposit of Twenty-five Dollars for each set, to be refunded upon the return of such set in good condition within 10 days after the opening of bids.

It shall be understood that all documents referred to in this Notice to Bidders shall be carefully examined and read and are all hereby made a part of the Proposal.

J. W. HUFFMAN,
City Purchasing Agent

Bids: June 21, 1955

Contract EXD-130.016

ADVERTISEMENT

THE PORT OF NEW YORK AUTHORITY
PORT AUTHORITY BUILDING
SEVENTH FLOOR ALTERATIONS

Sealed proposals for performing alterations including air-conditioning to the southeastrly portion of the seventh floor of the Port Authority Building at Eighth Avenue and Fifteenth Street, New York City, will be received at the office of the Chief Engineer of The Port of New York Authority, Room 1100, 111 Eighth Avenue, New York 11, N. Y., until 2:30 P.M. on Tuesday, June 21, 1955, at which time said proposals will be opened and read in Room 1108.

Contract documents may be seen at the office of the Engineer of Materials of the Authority, Room 1112. Documents will be furnished upon deposit of $30.00 per set for not more than three sets to any one company (each set including one copy of the contract drawings). Additional sets will be furnished upon payment of $30.00 per set, which payment is not returnable. Deposits and payments shall be delivered to the Treasury Department, Room 1001, where a receipt in duplicate will be issued. A copy of the receipt shall be delivered to Room 1112, where the documents will be furnished.

Those who have submitted a bid on the contract will receive a refund of the deposit for each set of documents, not exceeding three, returned within forty days after the opening of proposals. Those who have not submitted a bid will receive a refund of one-half of the deposit for each set of documents, not exceeding three, returned within forty days after the opening of proposals.

THE PORT OF NEW YORK AUTHORITY
Donald V. Lowe, Chairman

New York, May 26, 1955

Bids: June 7, 1955

New Jersey Turnpike Authority

ADVERTISEMENT FOR PROPOSALS
CONTRACT NO. W-14E

Sealed proposals are invited for Contract No. W-14E in connection with the structural steel work for the service buildings at Service Areas 6N and 6S on the New Jersey Turnpike, in Mercer County.

Proposals will be received at the New Jersey Turnpike Authority Administration Building, New Brunswick, New Jersey, until 11:00 O'Clock, Eastern Daylight Saving Time, on the morning of June 7, 1955, a which time and place said proposals will be publicly opened and read.

Bidders must submit with their proposal a Contractor's Financial and Equipment Statement.

Contract documents may be examined during office hours after May 23, 1955, at the office of the Authority and at the office of the Consulting Architects, Lorimer and Rose, 254 W. 54th Street, New York 19, New York. Contract documents will be furnished upon payment of Ten Dollars ($10.00) for each set, upon application to the Authority. Contract documents are not required to be returned and the payment will not be refunded.

NEW JERSEY TURNPIKE AUTHORITY
Paul L. Troast, Chairman

May 20, 1955

Bids: June 15, 1955

Indiana Toll Road Commission
309 W. Washington Street
Old Trails Building
Indianapolis, Indiana

NOTICE TO BIDDERS

Contract No. C-9

Sealed proposals will be received by the Indiana Toll Road Commission at or before 10:00 A.M., Central Standard Time, June 15, 1955, for the performance of the contract enumerated.

The grading, drainage structures and paving of approximately 2.5 miles in construction section C-9 of the Indiana East West Toll Road beginning at a point about 4,730 feet west of the centerline of Buchanan Street at Toll Road Centerline Station 883 plus 02.64 and extending eastwardly to a point about 1,706 feet east of the centerline of Virginia Street at Toll Road centerline station 1013 plus 30-, all in the city of Gary, Lake County, Indiana. The approximate quantities of the major items of construction are as follows:

Common Excavation	14,000 Cubic Yards
Peat Excavation	711,000 Cubic Yards
Borrow	865,000 Cubic Yards
Special Fill for Peat Deposits	817,400 Cubic Yards
Waterway Excavation	82,000 Cubic Yards
Hot Asphaltic Concrete Surface Course	1,360 Tons
2" Asphlatic Concrete wearing Surface for structures	30,100 Square Yards
10" Reinforced Concrete Pavement	72,000 Square Yards
Culverts, Pipes and Underdrains	17,800 Lineal Feet
Steel Piling	21,000 Lineal Feet
Timber Piling	29,000 Lineal Feet
Concrete for Structures	19,300 Cubic Yards
Reinforcing Steel	2,665,000 Pounds
Fabricated Structural Steel	11,730,000 Pounds
Metal Handrail	11,000 Lineal Feet

Copies of the Plans, Specifications and Proposal Forms for said Contract are available for public inspection or purchase at the office of the Chief Engineer, Indiana Toll Road Commission, 309 W. Washington Street, Indianapolis, Indiana. These documents may be purchased from said Chief Engineer for the following sums, per set, which sums are non-returnable:

Standard Specifications for the Indiana East-West Toll Road	$5.00
Plans, Special Provisions and Proposal Forms, per set, per Construction Section	$25.00
Informational Drawings	
Cross Sections, per set, per Construction Section	$25.00
Soil Plan and Profiles, per set, per Construction Section	$5.00

All Proposals must be on the form prescribed by the Commission and must comply with the terms and conditions set forth in the Contract Documents.

Contractors statement for qualification on the forms supplied by the Commission will be required from all Bidders.

Each Proposal must be accompanied by a Proposal Guaranty in the amount of five (5%) percent of the total price bid per Construction Section covered by the Contract. The Proposal Guaranty shall be in the form of an acceptable surety bond or a certified check on a solvent bank.

If the Bidder is an out of state corporation, he shall be required to furnish a certificate from the Secretary of State of Indiana as evidence that the corporation has complied with the Indiana Foreign Corporation Statutes, and that the Corporation is authorized to transact business in the State of Indiana.

All bids must be received at or before 10:00 A.M., Central Standard Time, June 15, 1955, in the offices of the Indiana Toll Road Commission, 309 W. Washington Street, Indianapolis, Indiana. At said hour, the bid box will be publicly opened and the bids read.

The award of the above Contract, if any award be made, will be to the Bidder or Bidders whose Proposal is lowest and best for the performance of the work, taken as a whole, and complies with all the prescribed requirements. The Commission reserves the right to reject any or all Proposals and to waive technicalities.

INDIANA TOLL ROAD COMMISSION
Dr. Dillon Geiger
Chairman

Charles W. Keating
Secretary-Treasurer

OFFICIAL PROPOSALS

Bids: July 1, 1955

Construction of a Sewage Treatment Plant

ADVERTISEMENT

Notice is hereby given that sealed bids will be received in accordance with the law by the Puerto Rico Aqueduct and Sewer Authority until 3:00 o'clock P.M. on the first day of July, 1955, at the office of the Authority in Santurce, Puerto Rico, and will then be publicly opened and read.

The work comprises furnishing materials and performing the labor for the furnishing of equipment for and the construction of the Puerto Nuevo Sewage Treatment Plant, a primary sewage treatment plant with an initial capacity of twenty-four (24) million gallons per day.

Copies of the plans and specifications may be examined without charge at the office of the Puerto Rico Aqueduct and Sewer Authority, Santurce, Puerto Rico, or at the offices of Buck, Seifert and Jost, Consulting Engineers, 223 Manuel V. Domenech Street, Hato Rey, Puerto Rico and 112 East 19th Street, New York 3, New York. Copies thereof may be obtained at the office of the Treasurer of the Puerto Rico Aqueduct and Sewer Authority, Stop 26½, Fernandez Juncos Avenue, Santurce, Puerto Rico or at the office of Buck, Seifert and Jost, Consulting Engineers, 112 East 19th Street, New York 3, New York, upon deposit of cash or certified check payable to the Puerto Rico Aqueduct & Sewer Authority in the amount of One Hundred and Fifty ($150.00) Dollars, which sum will be refunded upon return of the plans and specifications in good condition within twenty (20) days after the date on which bids are received or else the entire deposit will be forfeited.

Bids will be received only from persons who have requested the plans and specifications and made the required deposit therefore under their own names. These documents cannot be obtained later than June 15, 1955.

The work to be performed is divided into six (6) sections, under which the work is classified according to its character. The principal items of work are as follows:

SECTION B—Furnishing and delivering C.I.F. San Juan, Puerto Rico, one (1) mechanically cleaned bar screen in combination with one (1) screenings shredder, together with their mechanisms and appurtenances and the services of an expert to supervise the installation and testing of the equipment.

SECTION C—Furnishing and delivering C.I.F. San Juan, Puetro Rico, grit handling equipment for a forty (40') feet diameter grit chamber, including collecting and cleaning equipment and their mechanisms and appurtenances, together with the services of an expert to supervise the installation and testing of the equipment.

SECTION D—Furnishing and delivering C.I.F. San Juan, Puerto Rico, sludge collectors and accessory equipment for four (4) settling tanks, together with their mechanisms and appurtenances, and the services of an expert to supervise the installation and testing equipment.

SECTION E—Furnishing and delivering C.I.F. San Juan, Puerto Rico, chlorinating equipment, including three (3) chlorinators, three (3) evaporators, two (2) scales and all piping required for chlorine gas and chlorine solution, together with their mechanisms and appurtenances and the services of an expert to supervise the installation and testing of the equipment.

SECTION F—Furnishing and delivering C.I.F. San Juan, Puerto Rico, four (4) electric motor driven sewage pumping units, one (1) unit of seven thousand (7,000) gallons per minute capacity, two (2) units of fourteen thousand (14,000) gallons per minute capacity and one (1) unit of twenty-one thousand (21,000) gallons per minute capacity, complete with their motors, mechanisms and appurtenances and the services of an expert to supervise the installation and testing of the equipment.

SECTION G—Constructing the Puerto Nuevo Sewage Treatment Plant including influent sewer, influent junction chamber, screening chamber, main sewage pumping station, grit chamber, settling tanks, effluent chamber, outfall sewer, sludge pumping station, sludge digestion tanks and digester control building, non-potable water supply system, administration building, garage and shop, outside connecting piping, roadways and paths, grading, miscellaneous structures and appurtenances and the installation of screening, grit handling, settling tank, chlorinating and pumping equipment furnished by others.

Bidders will be allowed to bid on one (1) or more sections.

Each proposal must be accompanied by a certified check or bid bond from a reliable surety company authorized to do business in Puerto Rico and satisfactory to the Authority in amount equal to five (5%) percent of the proposal. The certified checks will be retained to pay for any damage or loss to the Authority or the liability bond will accrue in case the successful bidder shall neglect or refuse to enter into a contract in accordance with his proposal.

The Authority reserves the right to consider bids for thirty (30) days after their receipt before awarding any contract and the right is reserved to waive any informalities, to accept any bid or to reject any or all of them.

PUERTO RICO AQUEDUCT AND SEWER AUTHORITY
By RAFAEL V. URRUTIA
Executive Director

Bids: June 28, 1955

New Jersey Turnpike Authority

ADVERTISEMENT FOR PROPOSALS
CANTRACTS NOS. W-14A, W-14B, W-14C, AND W-14D

Sealed proposals are invited for Contracts Nos. W-14A, W-14B, W-14C, and W-14D in connection with the service buildings at Service Areas 6N and 6S on the New Jersey Turnpike, in Mercer County, as follows:

Contract No. W-14A—General Construction
Contract No. W-14B—Plumbing
Contract No. W-14C—Heating, Ventilation and Refrigeration
Contract No. W-14D—Electrical

Proposals will be received at the New Jersey Turnpike Authority Administration Building, New Brunswick, New Jersey, until 11:00 O'Clock, Eastern Daylight Saving Time, on the morning of June 28, 1955, at which time and place said proposals will be publicly opened and read.

Bidders must submit with their proposal a Contractor's Financial and Equipment Statement.

Contract documents may be examined during office hours after June 1, 1955 at the office of the Authority and at the office of the Consulting Architects, Lorimer and Rose, 254 W. 54th Street, New York 19, New York. Contract documents will be furnished upon payment of Ten Dollars ($10.00) for each set, upon application to the Authority. Contract documents are not required to be returned and the payment will not be refunded.

NEW JERSEY TURNPIKE AUTHORITY
Paul L. Troast, Chairman

May 26, 1955

Bids: June 30, 1955

Sewer Construction in Tunnel

Louisville and Jefferson County Metropolitan Sewer District, Louisville, Kentucky

Sealed proposals for the construction of approximately 1100 feet of 11'-0" x 16'-6" Inverted Egg Reinforced Concrete Sewer in tunnel beneath the Louisville & Nashville Railroad Yard in south central part of Louisville, Kentucky will be received on Thursday, June 30, 1955, until 12:00 o'clock noon Daylight Saving Time at the District office, 414 West Jefferson Street, Louisville, Kentucky, at which time they will be publicly opened and read.

Plans, specifications and information for Bidders will be available, Tuesday, May 24, 1955, at the office of the District which will be furnished to prospective bidders upon the deposit of $50 for complete set of Plans and Specifications. Said deposit will be refunded upon return of the Plans and Specifications after the Contract is awarded.

Bidder's Proposal must be accompanied by a certified check in an amount of Fifty Thousand ($50,000) dollars.

The District reserves the right to reject any or all bids or waive any informality in any bid and to accept any proposal considered by the District to be on the whole, the best.

E. H. West
Secretary-Treasurer

Bids: June 9, 1955

Pennsylvania Turnpike Commission
Harrisburg, Pennsylvania

NOTICE TO BIDDERS

Sealed proposals will be received by the Pennsylvania Turnpike Commission, through the Chairman, 11 North Fourth Street, Harrisburg, Pennsylvania, until 10:00 A.M., Eastern Daylight Saving Time, the 9th day of June 1955, and immediately thereafter will be taken to the Public Utility Commission's Hearing Room No. 1, North Office Building, State Capitol, Harrisburg, Pennsylvania, and publicly opened and read aloud for the following contracts:

For the construction of structures and the grading, drainage and paving of the Turnpike Section 36-G, part of the Northeastern Extension of the Pennsylvania Turnpike in Franklin Township and the Borough of Parryville, Garbon County, Commonwealth of Pennsylvania. This section being situated as follows:

Beginning at a point approximately 660 lineal feet north of the center line intersection of Legislative Route 163 and the Turnpike at Turnpike station 198+61 in Parryville Borough, Carbon County, thence in a northeasterly direction through a minus 1,678.67 lineal feet equation 21,476.33 lineal feet to Turnpike station 430+16 at a point approximately 154 lineal feet southeast of the existing center line crossing of Township Road 398 in Franklin Township, Carbon County, a distance of approximately 4.07 miles.

The approximate quantities of the principal items are as follows:

Class 1 Excavation	1,633,770 Cu. Yds.
Class 2 Excavation	23,270 Cu. Yds.
Class 2A Excavation	8,200 Cu. Yds.
Special Subgrade	243,222 Sq. Yds.
Reinforced Concrete Pavement	153,738 Sq. Yds.
Class A Concrete	2,205 Cu. Yds.
Class B Concrete	11,563 Cu. Yds.
Plain Steel Bars	1,114,597 Lbs.
Fabricated Structural Steel	529,785 Lbs.
Median Divider	20,144 Lin. Ft.
Cast-in-Place Concrete Piling	584 Lin. Ft.

Copies of plans, specifications and other contract documents, including cross-sections, are on file and open to public inspection at the office of the Pennsylvania Turnpike Commission located at Harrisburg, Pennsylvania, on May 19, 1955. Plans, specifications, cross-sections and other contract documents will be available by this date for inspection or for mailing to prospective bidders. Copies of Specifications for grading, drainage, paving and structures may be purchased from the Pennsylvania Turnpike Commission for the sum of five (5) dollars per copy. Copies of cross-sections may be purchased from the Pennsylvania Turnpike Commission for the sum of fifty (50) dollars per set.

Plans and contract documents, for this section exclusive of cross-sections and specification, may be purchased from the Pennsylvania Turnpike Commission for the sum of twenty (20) dollars for each set. No refund will be made for plans returned unless the project is withdrawn from letting by the Pennsylvania Turnpike Commission.

Remittances are payable by check or P.O. money order to the Pennsylvania Turnpike Commission and must accompany requests for drawings, specifications, contract documents, and cross-sections.

The character and amount of bid security to be furnished by the bidder is stated in the Instructions to Bidders.

The Commission reserves the right to waive any informalities in or to reject any or all bids.

No bids may be withdrawn for thirty (30) days after the scheduled closing time for receipt of bids.

PENNSYLVANIA TURNPIKE COMMISSION
James F. Torrance
Secretary and Treasurer

Harrisburg, Pennsylvania
9 May 1955

U. S. Government

Sealed proposals for the purchase of launches, barges, and pile driver offered for sale by Panama Canal Company under Invitation No. 168 will be received at the office of Procurement Officer, 21 West Street, New York 6, N. Y., until 10:30 A.M., E.S.T., June 16, 1955, at which time they will be publicly opened. Bid blanks and additional information available at Panama Canal Company, 21 West Street, New York 6, N. Y. BO 9-5380

Bids: June 9, 1955

Contract No. G-4

DELAWARE RIVER PORT AUTHORITY
Administration Building
Camden, New Jersey

STRINGER SPANS, SUPERSTRUCTURE FROM NEWTON CREEK TO NORTH-SOUTH FREEWAY OF THE BRIDGE OVER THE DELAWARE RIVER CONNECTING PACKER AVENUE, PHILADELPHIA, PENNSYLVANIA, AND GLOUCESTER, NEW JERSEY

Sealed bids will be received for Stringer spans, superstructure from Newton Creek to North-South Freeway of the bridge over the Delaware River connecting Packer Avenue, Philadelphia, Pennsylvania and Gloucester, New Jersey, known as Contract G-4, at the office of the Executive Director of the Delaware River Port Authority, Administration Building, Bridge Plaza, Camden, New Jersey until 2:30 P.M. (Daylight Saving Time), June 9, 1955, at which place and time they will be publicly opened and read by the Authority.

A more complete description of the work and full information for bidders are given in the Contract Documents and Specifications for this Contract, which may be obtained upon a deposit of $10.00 which will be remitted upon receipt of bid or the return in good condition of the copies so taken within thirty days after the opening of bids.

Each proposal must be accompanied by a certified check in the sum of $135,000 payable to the Delaware River Port Authority and drawn upon a National or State Bank or Trust Company having an office or place of business either in Philadelphia, Pennsylvania, or Camden, New Jersey, and must not be enclosed with the sealed bid. The surety's consent must be shown. The bidder to whom the contract is awarded will be required to furnish a Performance and Labor and Materialmen's Bond in the sum of 100 per cent.

The Authority will afford prospective bidders an opportunity to inspect the site of the work.

The Authority reserves the right to waive any informalities in the bids received; to reject any or all bids, and to award the contract only to those experienced in this class of work and to the bidder whose proposal is deemed by the Authority to be most advantageous to the public interest.

DELAWARE RIVER PORT AUTHORITY
JOSEPH K. COSTELLO
Executive Director

Bids: June 9, 1955

Pennsylvania Turnpike Commission
Harrisburg, Pennsylvania

NOTICE TO BIDDERS

Sealed proposals will be received by the Pennsylvania Turnpike Commission, through the Chairman, 11 North Fourth Street, Harrisburg, Pennsylvania, until 10:30 a. m., Eastern Daylight Saving Time, the 9th day of June 1955, and immediately thereafter will be taken to the Public Utility Commission's Hearing Room No. 1, North Office Building, State Capitol, Harrisburg, Pennsylvania, and publicly opened and read aloud for the following contract:

For the construction of structures and the grading, drainage, and paving of the Turnpike Section 36-H, part of the Northeastern Extension of the Pennsylvania Turnpike in Franklin and Penn Forest Townships, Carbon County, Commonwealth of Pennsylvania. This section being situated as follows:

Beginning at a point approximately 270 lineal feet southeast of the existing center line crossing of Township Road 398 at Turnpike station 429+00 in Franklin Township, Carbon County, thence through a minus 20.48 lineal foot equation in a northeasterly direction 30,779.52 lineal feet to Turnpike station 737+00 at a point approximately 3719.6 lineal feet northeast of the center line intersection of Legislative Route 13012 with the Turnpike in Penn Forest Township, Carbon County, a distance of approximately 5.83 miles.

The approximate quantities of the principal items are as follows:

Class I Excavation..2,124,000 cubic yards
Class II Ecavation....24,730 cubic yards
Class 2A Excavation...4,715 cubic yards
Special Subgrade...253,607 square yards
Class A Concrete.....255 cubic yards
Reinforced Concrete Pavement
164,157 square yards
Class B Concrete.....7,877 cubic yards
Plain Steel Bars.....562,110 pounds
Fabricated Structural Steel
193,700 pounds
Median Divider.....29,185 lineal feet

Copies of plans, specifications and other contract documents, including cross-sections, are on file and open to public inspection at the office of the Pennsylvania Turnpike Commission located at Harrisburg, Pennsylvania, on May 19, 1955. Plans, specifications, cross-sections and other contract documents will be available by this date for inspection or for mailing to prospective bidders. Copies of Specifications for grading, drainage, paving and structures may be purchased from the Pennsylvania Turnpike Commission for the sum of five (5) dollars per copy. Copies of cross-sections may be purchased from the Pennsylvania Turnpike Commission for the sum of fifty (50) dollars per set.

Plans and contract documents, for this section exclusive of cross-sections and specifications, may be purchased from the Pennsylvania Turnpike Commission for the sum of twenty (20) dollars for each set. No refund will be made for plans returned unless the project is withdrawn from letting by the Pennsylvania Turnpike Commission.

Remittances are payable by check or P. O. money order to the Pennsylvania Turnpike Commission and must accompany requests for drawings, specifications, contract documents, and cross-sections.

The character and amount of bid security to be furnished by the bidder is stated in the Instructions to Bidders.

The Commission reserves the right to waive any informalities in or to reject any or all bids.

No bids may be withdrawn for thirty (30) days after the scheduled closing time for receipt of bids.

PENNSYLVANIA TURNPIKE
COMMISSION
James F. Torrence
Secretary and Treasurer

Harrisburg, Pennsylvania
9 May 1955

Bids: May 30, 1955

Collecting and Disposing of Refuse

NOTICE TO ALL REFUSE COLLECTORS:

Sealed proposals will be received by the City of Columbia, South Carolina, until 11:00 A.M., E. S. T., Monday, May 30, 1955, at the office of the City Engineer, City Hall, Columbia, South Carolina, at which time they will be publicly opened, for the public work of COLLECTING AND DISPOSING OF REFUSE in the City of Columbia, South Carolina.

The population of Columbia in 1950, as determined by the United States Bureau of the Census, was 86,914. The present estimated population of Columbia, according to the Columbia Chamber of Commerce, is 95,000.

Specifications and Bid Proposal forms may be obtained from the office of the City Engineer, City Hall, Columbia, South Carolina.

T. F. Maxwell
City Manager

U. S. Government

Department of Commerce, Bureau of Public Roads, May 12, 1955.

SEALED BIDS will be received at the office of the Bureau of Public Roads, First National Bank Building, Florence, Alabama, until 10:00 A.M., C.S.T., JUNE 17, 1955, for the construction of Project 3G2, Natchez Trace Parkway, Webster County, Mississippi. 9.140 miles Grading, Draining, Structures, Gravel Base Course and other work from Line Creek Canal to Highway U. S. 82. The approximate quantities of the more important items are as follows: 736,000 cu. yd. Excavation and Borrow, 40,000 cu. yd. Gravel, 2,660 cu. yd. Concrete, 360,000 lb. Reinforcing Steel, 5,000 lin. ft. Concrete or Metal Culvert Pipe and 5,200 units of Seeding. Minimum wage rates have been fixed as required by law. Plans, Specifications, and Proposal Forms are available upon request at the address given above, or Bureau of Public Roads, 1440 Columbia Pike, Arlington 4, Virginia. H. J. Spelman, Division Engineer.

SEARCHLIGHT SECTION

Classified Advertising

EMPLOYMENT: BUSINESS: "OPPORTUNITIES" :EQUIPMENT :USED OR RESALE

UNDISPLAYED RATE

$1.80 a Line, minimum 3 lines. To figure advance payment count 5 average words as a line.
Discount of 10% is allowed if full payment is made in advance for 4 consecutive insertions.
POSITION WANTED undisplayed rate is one-half of above rate, payable in advance.
Box Numbers in care of our New York, Chicago and San Francisco Offices count as one additional line.
EQUIPMENT WANTED or FOR SALE Advertisements acceptable only in Displayed Style.

DISPLAYED RATE

The advertising rate $20.50 per inch for all advertising appearing on other than a contract basis. Contract rate quoted on request.
An advertising inch is measured ⅞ inch vertically on one col. 3 col.—30 inches to a page. E.N.R.
New Employment Opportunities Section for Displayed ads starting July 7th issue. For details see announcement ad in this section.

SEND NEW ADVERTISEMENTS to N. Y. office, 330 W. 42nd St., N. Y. 36, for June 9th issue, closing May 30th.

DRAFTSMEN
Archt'l., Elec., Mech., & Struct'l.

DESIGN ENGINEERS
Architectural & Electrical

INSPECTORS
Bldg., Mech., P.O.L., & Paving

Immediate Opening on Off-Continent Airbase. Mail Resume showing Dates, Salaries, & Min. Acceptable salary.

P-6601, Engineering News-Record
330 W. 42nd St., New York 36, N. Y.

DESIGN ENGINEERS

Permanent Openings Available at Our Cleveland, Ohio Offices for qualified DESIGNERS experienced in:

. . . . STRUCTURAL STEEL
. . . . REINFORCED CONCRETE
. . . . PRESSURE VESSEL
. . . . PROCESS PIPING
. . . . PROCESS HEATERS
. . . . EQUIPMENT SPECIFICATIONS
. . . . INSTRUMENT SPECIFICATIONS
. . . . HEAVY MACHINES

- - - - Top Hourly Rates
- - - - Bonus Participation
- - - - Moving Expense Allowance

WRITE—giving complete details of experience, education, age, etc.—to:

E. A. Kolner,

ARTHUR G. McKEE & COMPANY
2300 Chester Ave. Cleveland 1, Ohio

OPPORTUNITIES FOR ENGINEERS

UNION CARBIDE and CARBON Corp.

The General Engineering Department of the Electro Metallurgical Company has the Following Diversified and Interesting Openings for Graduated Engineers and Draftsmen:

PROJECT ENGINEER, to head up a complete project, both the design and construction phases thereof; to supervise overall engineering, material acquisition, cost and construction of project. Top flight engineer with broad experience required.

COST ENGINEER, to prepare construction cost estimates and to control construction expenditures; should be thoroughly familiar with general construction costs throughout the United States. Minimum of five years experience essential.

CONSTRUCTION ENGINEER, under a Project Engineer to follow the construction work of one or more projects and supervise the field work thereof. On major projects would actually supervise field forces and as such would assume the duties of Resident engineer. Top flight engineer, whose major experience has been in large-scale construction.

MECHANICAL ENGINEERS, to supervise the mechanical design of projects of varying magnitude. Responsible for the overall mechanical design work and guidance of capable designers and draftsmen for each project. Minimum of ten years experience essential.

SUPERVISING DESIGN ENGINEERS in the following categories: one each Mechanical, Electrical, Chemical, Civil. Capable men to design or supervise design of major structures, buildings, services, and utilities for varying sized projects. Select machinery and equipment; prepare cost estimates, specifications, requisitions; make bid comparisons for equipment purchases and construction costs. When necessary, supervise erection of buildings and installation of machinery, etc. at job site. Five to ten years experience essential.

SERVICE ENGINEERS—qualified mechanical engineers preferred, with five to ten years experience in trouble-shooting on heavy industry equipment and processes. Must be able to analyze production and/or equipment inadequacies, make constructive recommendations for improvement, and put same into effect.

SENIOR DESIGN ENGINEER-MECHANICAL, with a minimum of five years experience. Able to lay out and design machinery, structures and equipment in heavy industry plants, with special emphasis on materials-handling installations, dust collection, and fluid mechanics. Capable of directing work of Draftsmen, Detailers, and Junior Design Engineers.

JUNIOR DESIGN ENGINEER-MECHANICAL, with three to five years experience, of qualifications similar to above but with less experience required.

DRAFTSMEN (3—Mechanical, 3—Electrical, 4—Structural) with a minimum of three years experience. Work would involve layout of machinery, buildings, size and arrangement of piping, and electrical wiring diagrams and layouts.

Please send complete resume to:

Electro Metallurgical Company

A Division of Union Carbide and Carbon Corp.

The Personnel Evaluation Office

Niagara Falls, New York

HIGHWAY ENGINEERS

Designers, Detailers and Draftsmen

For Field and Office Work on Toll Highway Projects. Permanent employment.

P. O. Box 361 Mobile, Alabama

ENGINEERS

EXPERIENCED IN

DESIGN—TOOLING METHODS AND TIME STUDY

Write Personnel Dept.

THE JEFFREY MANUFACTURING CO.

COLUMBUS 16, OHIO

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

Gunite Engineer for estimating and project coordination as assistant to President of Nationally known Gunite Company, Philadelphia area. P-6085, Engineering News-Record.

Estimator, for firm doing extensive sewer, watermain, treatment plant, heavy construction. Must be graduate engineer or have extensive engineering background, with ability to obtain price and job information. Permanent position for qualified applicant. P-6074, Engineering News-Record.

Estimator-Office Engineer—Experience in engineering type construction preferred. Excellent opportunity for profit sharing arrangement for qualified man. Submit complete education, experience background, salary requirement to United Construction Co., Inc. Box 5104—Memphis 12, Tenn.

Asphalt Road Superintendent permanent position, write stating qualifications to: Box 142, Greenwich, Connecticut.

Wanted. Sanitary or Civil Engineers as resident engineers on large sewage project involving sewage treatment plant, pumping stations, and 63-½ miles of intercepting sewers including 30 miles in tunnel. Program calls for 3-year construction period. Must be experienced. Give full particulars and salary first letter. Allegheny County Sanitary Authority, 701 Civic Building, Pittsburgh 19, Pennsylvania.

Wanted: Construction Superintendent and Foreman for Water Mains and sewers. Steady employment in or near Indianapolis. Experience required. P-6434, Engineering News-Record.

Engineer—Married man about 40 years of age. Experienced in water mains, roads and sewer construction. Steady employment 12 months per year with two weeks vacation. Write P-6378, Engineering News-Record.

Sprinkler Engineer (Mid-West)—Must be experienced in design, installation, and sales to head up and manage automatic sprinkler division of AAA-1 Company. Permanent position, excellent opportunity. Write giving resume of experience, education and salary requirements. P-6388, Engineering News-Record.

Architect or Engineer—Opportunity for young graduate engineer to supervise construction store buildings for large variety store chain. Considerable traveling. Write details, age, education, marital status, starting salary. P-6387, Engineering News-Record.

POSITIONS VACANT

Experienced Estimator and Chief Engineer between the ages of 34 and 48 for preparing estimates, pricing, purchasing, expediting and job management. Permanent position for top man with Midwest General Contracting Firm specializing in industrial, commercial and public works. None other but top man need apply as this job will be in the capacity as assistant to the President. Send complete history, including education, past experiences, references, salary expected and photograph if available. P-6400, Engineering News-Record.

Teaching Position—Engineering Graduate, Industrial and teaching experience desirable. Opportunity to work on advanced degree. Write: Head, Department of Engineering Drawing, Iowa State College, Ames, Iowa.

Construction Estimator experienced in competitive bidding, (quantity take-off, pricing, sub-bids etc.) for all types of building required by established and progressive general contractor in North Western Ohio and Michigan. Engineering degree preferred but not essential. Write stating qualifications, previous employment, availability and references. Salary open, commensurate with experience and ability. Permanent position for qualified applicant. P-6405, Engineering News-Record.

Young Engineer interested in concrete. Location Ohio. Salary $400. plus. Liberal travel allowance. P-6383, Engineering News-Record.

Civil Engineer, experienced in the design and layout of subdivisions, sewers, water mains and grading. This is a career opening in a consulting engineer's office. Starting salary, $5200.00. State experience, education and give references. Lester V. Johnson Associates, 2309 Wilson Boulevard, Arlington 1, Virginia.

Wanted Field Engineer, transitman, rodman qualified to stake out highway location cross-section and stake line and grade for structures in New York State. Reply References, education, age and salary required. Reply P-6488, Engineering News-Record.

Engineer experienced in precise heavy construction surveys for work in north central states. Send record resume, reference and salary requirement to P-6506, Engineering News-Record.

Assessment Department Vacancy. Some engineering and building experience desirable. Fine opportunity to advance to head of department. C. Leland Wood, City Manager, Watertown, New York.

Concrete Paving Superintendent—Thoroughly experienced in all phases of highway and airport construction, including excavation, drainage, and paving. Must be able to handle complete supervision of concrete paving. Excellent opportunity for qualified man. Western New York Area. P-6514, Engineering News-Record.

Wanted—Concrete aggregate superintendent for assignment in Spain. Must be capable of initiating and directing plant erection and operation for production of crushed stone and sand-gravel. Write giving full particulars regarding personal history and work experience. Western Contracting Corporation, Sioux City, Iowa.

Foreman-Superintendent—Thoroughly experienced in field supervision in excavation and grading on heavy construction projects. Western New York State. P-6517, Engineering News-Record.

Wanted—Young Civil or Sanitary Engineers with at least 3 years experience for developing waterworks and sewage disposal facilities in smaller communities. Character and habits must be above reproach. Submit qualifications and references. Salary commensurate with ability. Gardner & Sterling, Consulting Engineers, P. O. Box 74, Salisbury, Maryland.

Superintendent-Foreman — Aggressive and thoroughly experienced in blacktop paving, capable of organizing and directing complete projects, including grading, drainage, and paving. Excellent opportunity with a substantial firm. New York State. P-6518, Engineering News-Record.

Wanted—Two experienced structural engineering designers or structural draftsmen by constulting engineer's office. Location San Francisco. P-6512, Engineering News-Record.

Engineering Graduate with structural concrete experience for technical and promotional field work in Eastern Pennsylvania. Permanent. Old-established national organization. Reply should include summary of experience and salary requirements. P-6554, Engineering News-Record.

(Continued on following page)

POSITIONS VACANT

(Continued from preceding page)

Asst. City Engineer. Must be able to supervise a medium-sized staff of professional and sub-professional engineers in the perparation of plans for street, sanitary, and water installations. Mich. P.E. required. Immediate opening for ambitious man with experience. Salary $7,736 to $8,684 per yr. Submit brochure with request for bulletin and application, Department of Personnel, City Hall, Dearborn, Mich.

Wanted Maintenance Engineer, professional license, experienced in building repair and service; heating systems; structural preservation; (allied services) to direct maintenance personnel and activities in public school system, North Jersey area. Give full background and salary in first reply. P-6550, Engineering News-Record.

Chief Draftsman for old established structural fabricating shop in Central Indiana. 20,000 tons per year. Tier and mill building and bridge experience desirable. Write detailed summary of experience and salary expected. P-6556, Engineering News-Record.

Grad. Civil Engineer with three years road construction exp. Pref. Western States resident, age 25 to 40. Salary range, $472-597 mo. Retirement, sick leave, vacation, good opportunity for advancement. Send brief resume of education, exp. etc., to Personnel Dept., Court House, Ventura, Calif.

Construction Engineer. Able to design simple tresses. Experienced in a variety of heavy concrete construction. Manhattan permanent. Opportunity for advancement. P-6582, Engineering News-Record.

Application Engineer for sales office of company manufactuirng chlorination equipment for water and sewage treatment. This is a rapidly growing new division of an organization well established in the industrial instrument field. Excellent opportunity for ambitious man with sanitary engineering education and experience. Reply to P-6576, Engineering News-Record.

Construction Foreman for firm engaged in extensive sewer, water main and treatment plant facilities. Permanent position in N. Y. State area. Only qualified applicants with broad experience. P-6595, Engineering News-Record.

EMPLOYMENT AGENCIES

Wanted Engineers, Designers, Draftsmen-Structural, Architectural, M.E., C.E., E.E., and Ind., also Teachers and Chemists, Cleveland Engineering Agency, 2132 E. 9, Cleveland.

POSITIONS WANTED

Bridge construction superintendent nine years experience, pile driving, foundation excavation, form and concrete work, 32 years old, sober, will travel U. S., PW-6523, Engineering News-Record.

Field Engineer or Party Chief desires position in central or southern Florida. 6 years exp., in heavy construction and highway engineering. Past 18 mo., on Ohio Turnpike Proj. #1. 1954 salary $5,887.50. Available July 1, 1955. For complete resume write PW-6522, Engineering News-Record.

Civil Engineer, P.E., 32, experienced construction, Government contract administration, design, and specifications. Desire permanent position with advancement opportunities. PW-6521, Engineering News-Record.

Superintendent Manager, 23 yrs. exp. geology engineering, heavy excavating, design & construc. crushing, screening, cleaning plants, earth roads, heavy hauling blast, core, rotary auger drills, heavy blasting, coal and mineral mining, machine shop work maintenance all kinds heavy equiment, complete charge 3 companies, opr. sales, management, knows costs, payrolls, purchasing, can handle problems, now Pa., relocate; references, address Box PW-6476, Engineering News-Record.

Management and Administration of engineering, construction, operations or maintenance. Graduate registered engineer. Age 40. Outstanding record municipal, private, governmental work, including construction projects of magnitude. Currently completing $11,-500,000 school construction program. Experienced and capable all phases planning, contract administration, inspection, completion and contract closing. PW-6487, Engineering News-Record.

Construction Engineer, 18 years experience, age 39, seven years Latin America, fluent Spanish, French, Italian, Portuguese. Industrial plants, buildings, airfields, highways. Will consider any position, foreign or domestic. PW-6528, Engineering News-Record.

HIGHWAY ENGINEERS

Designers, Detailers and Draftsmen for office work on highways and expressways. Long-term projects. Desire experience or training including alignment and profile computations, geometric design of interchanges and associated work.

Employee Benefit and Retirement Plan, paid vacations and holidays, sick leave. Modern, air conditioned offices in downtown St. Louis. Please write fully to or inquire at

SVERDRUP & PARCEL ENGINEERING CO.

1625 Eye Street, N. W. Washington 6, D. C.

1134 Locust St. Louis 1, Mo.

Transportation Consultant

Graduate Civil Engineer 28 years railroad experience, completing 5 years foreign service railroad and harbor operations and maintenance, surveys, reports and analysis, available after July 1st. Resume and commendations upon request.

PW-6417, Engineering News-Record
330 W. 42 St., New York 36, N. Y.

POSITIONS WANTED

Civil Engineer—5 years diversified experience with contractors and engineers in field and office on constr. of industrial bldgs. of steel, reinf. and precast concrete. Good knowledge of detailing, quantity take-offs, expediting and subcontract work. Capable coordinator and liason man. Desire permanent position. PW-6508, Engineering News-Record.

Top flight piping engineer, 20 years broad experience, all phases industrial piping, heavy machy, conveyors, water treatment, sewage plants, go anywhere. PW-6374, Engineering News-Record.

Construction or Promotion Engineer, 30, B.S.C.E. 8 years experience heavy construction and promotional sales, desires position in Eastern Nebraska. PW-6544, Engineering News-Record.

Construction Engineer-Superintendent. Graduate Engineer, age 33. Seven years experience industrial and commercial building construction. PW-6585, Engineering News-Record.

Piping and Plumbing Superintendent. Available soon. Excellent qualifications and references. Diversified experience on large piping projects including chemical process, powerhouses, industrial, commercial and domestic. PW-6577, Engineering News-Record.

Senior Estimator with broad experience in bidding, costs, general supervision, company management, architect and owner contacts. Record of over 20 years with highly rated general contractors. Southern or Western locations. PW-6571, Engineering News-Record.

Field Supt. or General Foreman, 55. 30 years experience, heavy excavation dams, railroads, airports and thruways. PW-6568, Engineering News-Record.

BUSINESS OPPORTUNITY

Wanted to Buy stone and aspalt paving business. Prefer plant operations. BO-6583, Engineering News-Record.

Attention . . .

EMPLOYMENT ADVERTISERS

Effective with the first July issue, a new section will start in ENGINEERING NEWS-RECORD. We will head this section: EMPLOYMENT OPPORTUNITIES. All Displayed Employment Opportunity advertising will be placed in this new section, with the exception of those advertisers who contract for run-of-book position. New advertisers will be billed at the transient rate of $24.25 unless on contract. Contract rates furnished on request. Advertisements are subject to Agency Commission.

LEARN ESTIMATING

Complete Building Estimators Course, also Building Labor Calculator for practicing estimators. Thirty-fourth year serving the building industry. For free trial and all particulars write:

TAMBLYN SYSTEM
1420 Gilpin St. Denver 6, Colorado

Engineers—Foremen—Office Men

Learn latest methods to organize and run work. Prepare for the top jobs.
Send post card for details.

GEO. E. DEATHERAGE & SON
CONSTRUCTION CONSULTANTS
411 So. 5th Ave. Lake Worth, Florida

STRUCTURAL ENGINEERING
ARCHITECTURAL ENGINEERING
OUR COURSES of instruction by mail HAVE HELPED THOUSANDS to better positions and to pass State Board Examinations. Forty-third year.

WILSON *Engineering Corp*
College House Offices HARVARD SQ. CAMBRIDGE MASS

expert repairs or complete overhauling by skilled craftsmen on all makes and types. Precision guaranteed.

FINE RENTAL INSTRUMENTS

Reasonable rates, on monthly or yearly basis. All instruments guaranteed to be in first class condition.

David White COMPANY
319 W. Court St. Milwaukee 12, Wis.

WANTED

All-Steel, Standard Gauge, Side Dump, Drop Door

Dump Cars

70-Ton, 30- or 50-Cubic Yard Capacity

W-6161, Engineering News-Record
520 No. Michigan Ave., Chicago 11, Ill.

WANTED TO BUY

4000' 15 or 16" CONCRETE FORMS

WILLIAMS CONSTRUCTION CO.
Box 145 Baltimore 20, Md.

COMPRESSOR DIRECTORY

World's Best Rebuilts

PORTABLE

55 CFM	Lindsay gas	$ 650.00
60 CFM	LeRoy gas	$1100.00
60 CFM	Worthington gas (New)	$1700.00
105 CFM	Worthington gas	$ 975.00
160 CFM	Worthington gas	$1375.00
315 CFM	Worthington (Diesel)	$3700.00
500 CFM	Worthington — Diesel	$5100.00
600 CFM	Worthington — Diesel (2 months old)	$9000.00

STATIONARY

254 CFM	125 PSI 10 x 10 Ing. ER1
278 CFM	125 PSI (2) stage CPTPR50
285 CFM	125 PSI (2) stage Gardner "WB"
354 CFM	Vacuum 14 x 5 Ing. Rand ER
364 CFM	20 PSI 12 x 7 Gardner RX
400 CFM	20 PSI Nash Hytor L-5
450 CFM	4 PSI Spencer Turbo
510 CFM	125 PSI 13-8 x 12 Ing. XRB

Air cooled (2 stage 5HP to 100HP all makes

550 CFM	Vacuum 17 x 6 Chicago "A"
676 CFM	125 PSI 15-9¼ x 12 Ing. XRB
720 CFM	Vacuum 18 x 7 Worth. HBV
780 CFM	55 PSI 17 x 12 Penn 3A
875 CFM	40 PSI 18 x 12 Penn 3A
931 CFM	55 PSI 17 x 13 Chicago TB
1084 CFM	30 PSI 20 x 12 Ing. Rand ER1
1184 CFM	Vacuum 22 x 9 Penn 7AT

1351 CFM 125 PSI 18½-11½ x 8½ Worth YC2 200 HP 3-60-220 (see it run)

1574 CFM	100 PSI 22-14 x 16 Ing. PRE2 250 HP 3-60-2300 (3) available
1681 CFM	Vacuum 24 x 13 Chicago TB
5780 CFM	60 PSI 28-28 x 27 Ing. PRE1 700 HP 3-60-2200

American
AIR COMPRESSOR CORP.
DELL AVE & 48th ST. NORTH BERGEN N. J.
Telephone UNion 5-4848

SHOVELS, ELECTRIC: 2—P & H, model 1600, 6 yd. capacity. Thoroughly modern, condition excellent.

DRYERS: Ruggles Coles (Hardinge Co.) 104" dia., 65 ft. length, and one 90" dia., 55 ft. length; both complete with all auxiliary equipment.

BELT CONVEYOR: 24" x 508 ft., 91 ft. lift, 20 H. P. motor, 220/440 volt, thoroughly modern, roller bearing equipped, condition like NEW.

JAW CRUSHERS: Allis Chalmers 18" x 30", sectionalized for underground use. V-Belt, 50 H. P., 220/440 volt motor, new condition. Other sizes 4" x 6" up to 48" x 60", with or without motors.

OVERHEAD ELECTRIC CRANES: 1—150 ton, 65' span, 230 volts, D. C., one 20 ton, 54' span, 220 volt D. C. with M. G. set; one 10 ton, 80' span and one 8 ton, 54' span, both 4 motor, bucket operating, 440 volt, A. C. Other cranes both AC and DC, various spans, 5 tons to 55 tons, 3 and 4 motor.

LOCOMOTIVE CRANE: 25 ton capacity, standard gauge, gasoline powered, cast steel trucks, air brakes, with or without 1¼ yd. Williams clam shell bucket, thoroughly modern, excellent condition. Located Minnesota. For sale or rent.

LOCOMOTIVES: 2—65 ton diesel electric, standard gauge, thoroughly modern, excellent condition. For sale or rent.

WE BUY AND SELL EQUIPMENT THROUGHOUT NORTH AND CENTRAL AMERICA

A. J. O'NEILL
Lansdowne, Pa.

Phila. Phones: MAdison 3-8300 - 3-8301

FOR SALE

Immediate Delivery—Excellent Condition

OUTSTANDING VALUES IN USED

CONCRETE PAVING EQUIPMENT

1—C.S. Johnson concrete plant w/135 yd. aggregate bin and 750 bbl. silo, elevator, complete
1—Blaw Knox 600-650 bbl. cement silo
1—Smith 2 yard Model 56S tilting mixer
1—C.S. Johnson concrete plant w/ 300 bbl. overhead silo w/ dual batchers, 400 bbl. ground storage, elevator & undertrack screw, complete
2—Koehring 34E dual drum pavers—nearly new
2—Jaeger & Blaw Knox 20'-25' concrete finishers and spreaders
2—Blaw Knox 10'-15' spreaders & finishers
1—Buckeye R.B. Finegrader for 20'-25'
1—P & H Single Pass Stabilizer
5,000 feet Heltzel 10" x 8" road forms
5,500 feet Blaw Knox 9" x 9" road forms
3,000 feet Metaform 8" x 8" road forms
4,400 feet Heltzel 12" x 16" reversible forms
8,000 feet Heltzel 12" x 16" reversible forms

WRITE—WIRE—CALL

AL J. GOODMAN
Dealer in Used Contractor's Equipment
Office 36456 Nite 5668
P. O. Box 263 ASHEVILLE, N. C.

PILE DRIVING EQUIPMENT

Vulcan and McKiernan-Terry
Steam Pile Hammers and Extractors
Drop Hammers - Driving Caps
Steel Leads - Pile Driver Hose
Hoists and Boilers

CONTRACTORS MACHINERY CO.
Phone VAlentine 4740
2637 SOUTHWEST BLVD.
KANSAS CITY 8, MO.

FOR SALE

1—¾yd. Shovel Front Only—New (For Lorain 41)
1—¾ yd. Lorain Shovel Model 41—Gas 3 Way Combination. Recently Rebuilt.
1—2 yd. Lorain Shovel Model 820—Rebuilt.
1—10 Ton 3 Wheel Buffalo Roller—Completely Rebuilt.
1—2 yd. 3000B Manitowoc Shovel—Good Condition.
2—2yd. 44B Bucyrus-Erie Shovels.
2—AD 3 Allis Chalmers Graders

FOR SALE OR RENT

2—27FD End Dump Euclids—Good Condition, Practically New Rubber.
3—Model 80D Euclids—1952, Excellent Condition.

TUCKAHOE CONSTRUCTION CO., INC.
116 Columbus Avenue Tuckahoe 7, N. Y.

FOR SALE

DIESEL ELECTRIC LOCOMOTIVES

STANDARD GAUGE
25 - 44 - 45 - 65 - 75 tons
and
5—G.E. 125 ton—1000 HP
Write for Details

FRANK M. JUDGE & CO., INC.
7010 Empire State Building
New York 1, N. Y.

MISCELLANEOUS FOR SALE

½ YARD K10 INSLEY CRAWLER CRANE Serial #229 ..... $3950.00

BROWNING LOCOMOTIVE CRANE Model 15C Serial #2104 1 Cubic Yard Clam Shell Bucket $2500.00

1-45 foot TOWERMOBILE Mounted on FORD V8 chassis.. $4000.00

Approximately **200 feet 24" BELT CONVEYOR** with walk-way and pipe frame, 40 feet 24" Channell frame $2750.00

Write, wire or phone Prospect 2-7854

CONSTRUCTION MATERIALS CO.
4623 Chippewa St. St. Louis, Mo.

FOR SALE OR RENT—EASY TERMS
Rebuilt — A 1 Condition

48B Bucyrus Erie Shovel 2 cy Diesel
Caterpillar Auto Patrol No. 12
Caterpillar D8 Bulldozer
Caterpillar Scraper Model 80
3—Caterpillar DW 10's

WILLIAMS CONSTRUCTION COMPANY
Box 145 Balto. 20, Md. Murdock 6-6600

Model 6 Northwest CRANE AND SHOVEL

Serial 13097. Fairleads and high gantry. D 13000 engine. Used mostly as concrete crane. Unusually fine condition. $32,000.

D. R. AGNEW Ronceverte, W. Va.

FOR SALE

5 cu. yd. Sauerman POWER DRAGLINE SCRAPER

Comp. with hoisting engines, head posts, propelled car, etc. Good oper. cond. Loc. New Jersey.

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EDITORIALS

School Needs Must Be Met

REPORTS FROM WASHINGTON indicate that legislation setting up federal aid for school construction stands almost no chance of being voted this year. While this news is certain to be disappointing to many communities that cannot build badly needed schools without financial assistance from a higher level of government, it has the favorable aspect from the national viewpoint of placing the burden where it should have rested in the first place—on the states.

Surveys show that most states are providing very little financial help to local districts for school construction. To make matters worse, existing assessment practices limit the taxing powers of local districts. In many cases, debt limits are too low.

Now that it becomes more apparent every day that Congress will not act on schools this year, and may not even act next year, the states should stop waiting for a federal handout and should proceed with programs of their own to reduce the classroom shortage.

To begin with, the states should encourage an all-out effort at the local level to raise the needed construction money. Where legal limitations stand in the way, state legislation will be necessary to expand local taxing powers. The states also should put more pressure on local school districts to consolidate where such a step would meet educational objectives.

Next, every effort should be made to see that the school districts get the most for the school building dollar. Every dollar saved means one more dollar's worth of school that can be built with available funds, fewer bonds to be sold and less state or federal aid. (Because of the importance of knowing where to cut corners without sacrifice of essential services, heavy emphasis has been placed on school construction costs in a special report in this issue prepared by the staff of Engineering News-Record.)

Even if all these steps are taken, there will be some school districts still unable to build all the classrooms needed without outside help. State grants and loans could eliminate the shortage in many of these. In many states, the legislatures could—and should—tap sources of revenue that are available but are not yet fully used and should apply the money to educational purposes.

Until the states show that they are doing their utmost to solve the school problem, federal aid cannot be distributed fairly or most effectively. But this does not mean that Congress should procrastinate until all the states act to help local districts. The shortage of classrooms is too critical to brook delay. Congress should make some money available for school construction as soon as possible but with incentives to stimulate the states to help themselves. Only a cooperative effort at all levels of government will insure that school needs will be met.

Simplicity Marks Academy Design

DISPLAY OF A MODEL of the projected Air Force Academy near Colorado Springs (see p. 22 for picture) confirms the statements made a few weeks ago to an ENR staff member by representatives of the architect-engineers on the job that from the outset they were neither shackled by precedent nor bound by any preconceived ideas on the building designs. This permitted elaborate exploration into the architectural and design requirements of the various facilities and their relations to each other.

In this study, the size and positioning of buildings was determined on the basis of supplying 2,640 cadets with living quarters, classrooms, laboratories and recreational facilities that would function efficiently. Then the theoretical positioning of the main elements was adapted to a sloping site with commanding views in all directions.

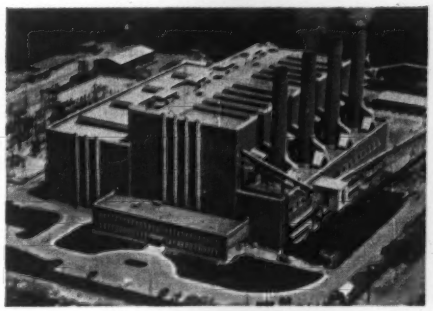
The end result is a fine appearing layout in which the simplicity of the architectural forms is noteworthy. Except for the chapel, all buildings depend on skillful use of mass and building materials—stone, concrete, metal and glass—for variety and attractive appearance.

Broader Training for Engineers

COLGATE UNIVERSITY has decided to offer its students an opportunity to use liberal arts as the base for an engineering training by participating in a five-year school program that will be completed in the School of Engineering at Columbia University or at Rensselaer Polytechnic Institute. Three years will be spent at Colgate and two at Columbia or RPI, the combined courses leading to both an AB and BS degree. As several other schools of engineering have entered into similar 3-2 arrangements with liberal arts colleges, the number of students who will have an opportunity to broaden the base of their training must now be large.

It is too early to say how many potential young engineers are going to take advantage of these cooperative programs. Working against widespread acceptance of that route for obtaining an engineering training is the cost, the longer time, and the breaking of school ties and friendships just at the time when they are most appreciated. For parents, the cost item probably looms largest. Tuitions have gone up sharply in recent years, and this plan adds a whole year's tuition.

But the experiment is well worth trying even though it may be a long time before there will be any clear evidence as to how successful it may be. When one looks back at the record of those engineers who played an important part in the early years of the development of this country and whose only formal education was in liberal arts, the conclusion seems inescapable that this step is in the right direction.



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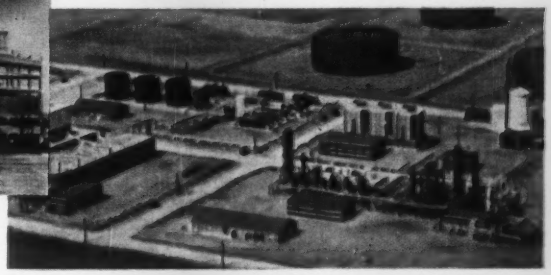

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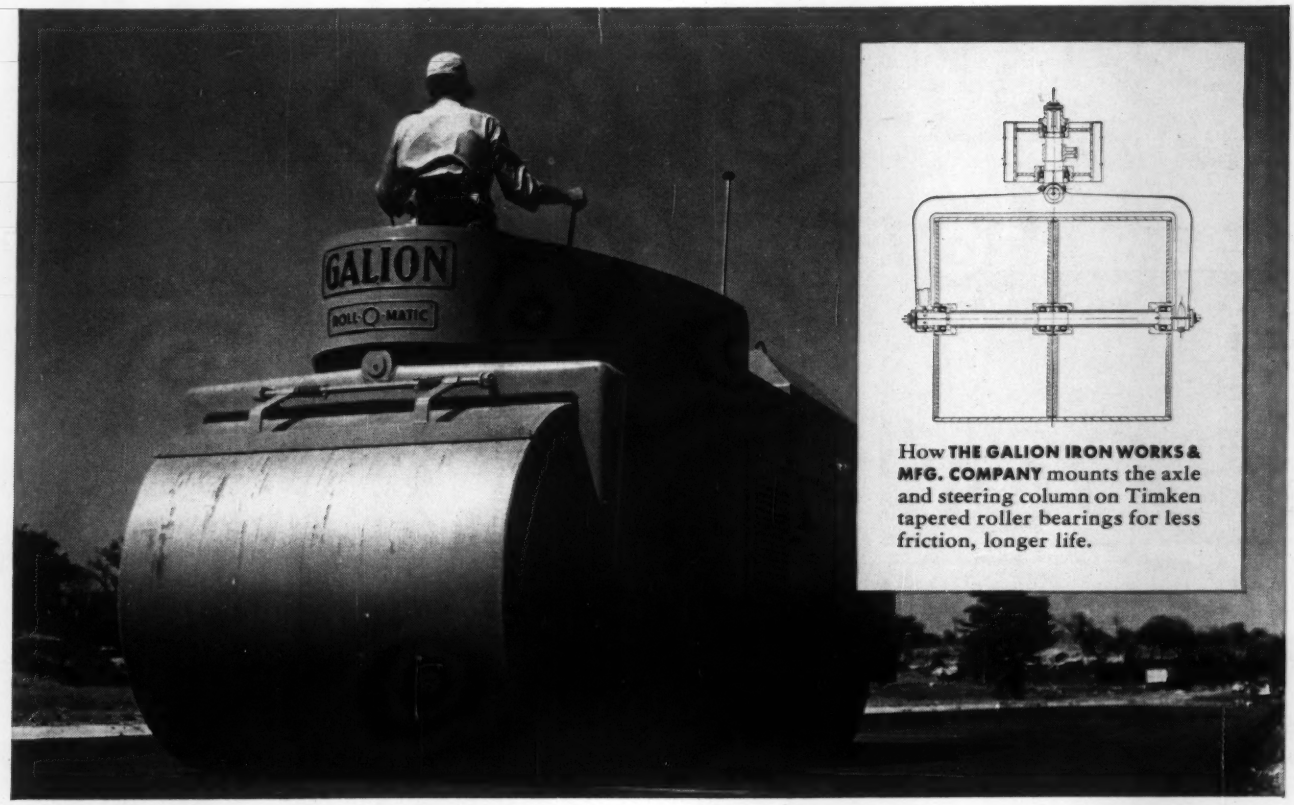
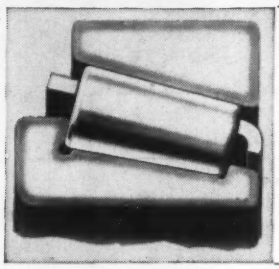


How **THE GALION IRON WORKS & MFG. COMPANY** mounts the axle and steering column on Timken tapered roller bearings for less friction, longer life.



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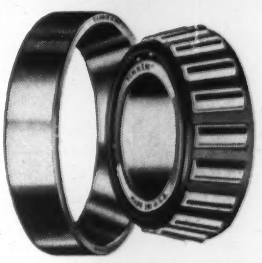

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